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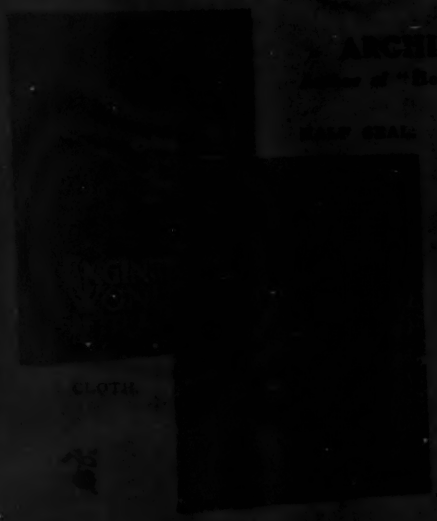

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MR. E. A. SEITZ,
Managing Director of the International Correspondence College.

A PRIVATE VENTURE.

SHOWING HOW COMMERCIAL ENTERPRISE FILLS A GAP IN THE PUBLIC SYSTEM OF EDUCATION.

BY "OBSERVER."

I RECENTLY visited a London establishment where the work of education is frankly and openly organised on a commercial basis. The experience was highly interesting and instructive, and it suggested many reflections, both pleasant and otherwise.

Germany has its Charlottenburg, and England will have its equivalent institution somewhere about the end of the present century. We have, however, many technical colleges doing excellent work, both in London and in the provinces, and the technological classes now in active work for the winter are numerous, and more or less efficient and effective. But there is, nevertheless, a great gap to be filled, and the International Correspondence College, which has its headquarters in Kingsway, appears to me at least to be filling it adequately and completely.

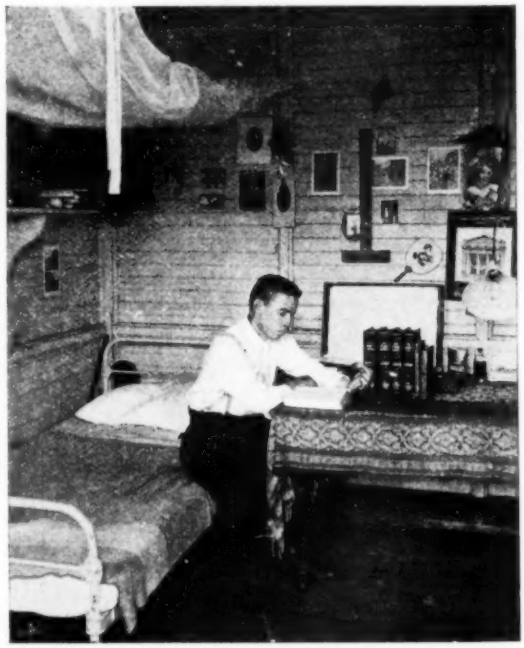
There is in the organisation no attempt to hoodwink either the student or the public. The directors of the college say, in effect, quite bluntly, "What about your wages? You wish to raise them? Then get yourself trained. Difficulties? We will override them. The necessary lessons shall be brought to you by the Mercurius of the G.P.O., the original and most successful aviator. You will pay us by instalments if you choose, and we undertake to fit you for a higher position and higher pay. Fill up the form and post it to us, and let us do the rest."

I watched them doing it, and there was a deadly earnestness about the work. Here, in the heart of the great metropolis, sits the teacher, while his pupil is hard at work in some great factory in the North or the Midlands, or in some outpost of Empire as shown in our picture, but ready to use his spare time to make himself more efficient and of greater value to his employer.

There are classes near to his home, no doubt, but many of them are thronged by heedless youths, whose presence does not help in the acquisition of sound knowledge. Besides, these boys have just left school, and in the matter of arithmetic, spelling, and general pertness are more than a match for the older student, whose schooldays lie far behind him.

But the aforesaid Mercurius, with a touch of his magic wand, dissolves all these difficulties. If the spelling, handwriting, and arithmetic are weak, the International Correspondence College will strengthen them before the technical work is undertaken. If the spare time is broken into by domestic cares—for the students number many heads of families—no harm is done, for the work may be resumed at a more opportune time. The college will not even interfere with judicious courting, knowing that the desire to start a home acts as a splendid incentive to improvement in knowledge and social position. These are human considerations that must be faced by the educator who will have nothing to do with correspondence tuition, and who clings to the shibboleth of "the personal influence" of the teacher. The correspondence method reaches students who can be dealt with by no other plan.

Besides, there are lonely students far removed from classes or personal tuition, and among them some of the finest brain material in the world—potential Faradays, Tyndals, Edisons, Marconis—needing only the opportunities which the Post Office, prompted by such institutions as the International Correspondence College, can afford to them. To read the records of some of these, as carded in the wonderful indexes of the College, was to look straight into the glowing heart of romance.



STUDENT C. HONEY IN THE BACHELORS' QUARTERS, PANAMA.

I was, of course, specially interested in the way that the college supplies the place of the personal teacher.

The usual method is to prescribe a standard text-book on a given subject, and supplement the explanatory book work with papers of notes, the aim of which is to bring the matter more nearly within the lonely student's grasp. This is, however, not the way of the International Correspondence College.

The text-books are the publications of the college itself, and they are written in such a way that if the student does not grasp the meaning of each paragraph as he goes on, it must, as a rule, be entirely his own fault. I watched a small corps of editors, writers, draughtsmen, and illustrators hard at work on text-books of this description, and began to realise to some extent on what foundation the success of the college is based. The learned author who writes for university students is not wanted here. The information must be set out in such a way that further explanation is quite unnecessary.

I have before me as I write several of the instruction papers such as are sent out periodically to students of the college. I take up one at random. It is entitled *Painting and Decorating*, and has doubtless found its way into the hands of many a young tradesman and artisan who wishes to improve his status. It contains fourteen excellent coloured plates, showing specimens of graining, mottling, and marbling, with simply-worded instructions on the various branches of the decorator's work. In the hands of a smart apprentice or young journeyman this single instruction paper will act as a better "guide, philosopher, and friend" than many a master craftsman with a single eye upon the profits of his business.

Another instruction paper deals simply, lucidly, and thoroughly with the Slide Rule. I have personally a merely literary and philosophical interest in mathematics, but I confess to a real fascination in this little pamphlet, and to a kindliness for an instrument which even I can now see so clearly performs mechanically various mathematical calculations which have always worried me. In the hands of any young engineer this instruction paper would prove absolutely invaluable.

With the aid of the phonograph the International Correspondence College tackles the important matter of the acquisition of foreign languages, and publishes in this connection an interesting pamphlet, which ought to be studied by all our readers, and especially by those who enter so regularly for our French Prize Competition. When a student enrols, the first instruction papers, records, and three blank cylinders for recitations are sent to him, together with a phonograph and directions for proceeding with his studies. After reading the instructions regarding the phonograph and its operation, the student turns to that part of his instruction paper containing his first elementary conversational lesson. He then places his first instruction record on the instrument, adjusts the hearing tubes, takes the instruction paper in his hand ready to read, and starts the instrument. He hears first about thirty foreign words, and then the same words arranged in different combinations as phrases and sentences. The words are spoken clearly, and come to his ear with the accent, inflection, and the very voice of his instructor. As the student hears the words from the instrument, he reads them in the foreign and the English text on the page in front of him. He thus learns in two ways at the same time, through the eye and through the ear.

The phonograph never loses temper, and will obligingly repeat again and again the word or phrase which is required to be learnt.

The students of the International Correspondence College are drawn from all ranks of society. An interesting branch of the college work is that which deals with the instruction of men in the army, and their preparation for taking up useful positions in civil life when their time of service is expired.

THE TEXT-BOOK WRITING DEPARTMENT.

It will be seen from the above that such an institution as the International Correspondence College is doing a large share of the work which ought to be performed by that State Department which is entrusted with the education of the nation. Moreover, those Government officials who are organising Mr. Churchill's labour exchanges might profitably pay a visit to Kingsway, where they will find that, so far as International Correspondence College students are concerned, their work has already been organised on an effective basis.

Throughout the entire work of the College there is that note of quiet earnestness which is the mark of perfect organisation. I came away wishing devoutly that for the sake of the public our State department was in the hands of such managers as Mr. E. A. Seitz, who presides over and controls the International Correspondence College.

GEOGRAPHY NOTES UP-TO-DATE.

BY E. R. WETHEY, M.A., F.R.G.S.

An International Map of the World.

AT last geographers, and especially teachers of geography, may congratulate themselves on the distinct prospect of beholding, possibly in the near future, an atlas of the world in which each map shall be on a uniform scale. At the end of last November a conference of delegates from the Great Powers met in London at the Foreign Office, and drew up a scheme for the construction of a map of the world on the scale of 1 : 1,000,000, or about sixteen miles to an inch. As delegates were present from the United Kingdom, the United States, Russia, Germany, France, Austria-Hungary, Italy, Spain, Canada, and Australia, the conference may be considered to be thoroughly international, and its instructions to cartographers thoroughly representative. The idea of the map is by no means new. As long ago as 1891, at the International Geographical Congress held at Bern, Dr. Albrecht Penck, the famous German geographer, formulated his scheme for a world map on this scale of 1 : 1,000,000. Succeeding conferences—London, 1895; Berlin, 1899; Washington, 1904; and Geneva, 1908—have all approved the scheme, though nothing much resulted until 1908, when the Geneva savants appointed a committee *ad hoc*. This committee drew up a systematic scheme, and it is practically this scheme which has been approved by the November conference of 1909.

Briefly, the scheme comprises the following recommendations :—

1. *Scale.*—1 : 1,000,000, or sixteen miles to an inch. The scale will be stated in kilometres, and, if desired by English-speaking countries, in miles also. The accompanying outline map of the Shetland Isles will give an idea of the amount of space which such a scale will ensure for the representation of geographical features. The ordinary school atlas—say, Philips's "Comparative Atlas"—of 10 inches by 8½, if it aims at uniformity, shows most European countries on a scale of 1 : 5,000,000, with variations—such as Russia 1 : 15,000,000, and the three great divisions of the British Isles 1 : 2,500,000 each.

2. *Projection.*—Modified polyconic. This is the projection which most of the school atlases again adopt for the continent of Europe. It is easily constructed, and, in the opinion of the conference, will permit every sheet to fit exactly together with each of the four sheets adjoining.

3. *Surface features.*—Hypsometric system—that is, contour lines. These lines are to be shown in brown for the land (in blue, we presume, for the sea) at intervals of 100 metres, or decimal multiples or sub-multiples of that number. Other national measures, in addition to the metre, may also be used. In cases where the features cannot well be indicated by contour lines—for example, cañons—shading will be used.

4. *Colouring.*—Greens for the lower altitudes, and browns for the higher; blue, deepening with the depth, for seas and lakes. The green will probably be used up to 300 metres, below which line the majority of the world's peoples live; tints of brown, darkening as the elevation increases, will take the map reader up to 7,000 metres, beyond which the mountains are to be left appropriately white. This is what is known now as the ordinary "international" method of colouring on the "layer" and "strata" principle, and is quite a familiar feature of the better type of present day school atlases. The general public knows it well enough in Bartholomew's tourist maps.

5. *Conventional signs.*—A whole host are recommended, with the object of indicating such important points as whether a river is perennial or non-perennial, navigable or non-navigable, and where obstacles to communication are to be found; whether a road is suitable or not for wheeled traffic; what railways are in existence, or in course of construction, or in contemplation; whether marshes are salt or fresh. There are also special symbols for telegraphs, post offices, boundaries (international and provincial), important towns, etc. Indications are also promised—and this is a very important point—to distinguish between

regions and districts accurately surveyed (as the British Isles), fairly well mapped (as Eastern Australia), and roughly mapped (as a great part of Africa).

6. *Spelling.*—Uniform, with the Latin alphabet as a base. Special rules are to be drawn up for transliteration from non-Latin alphabets.

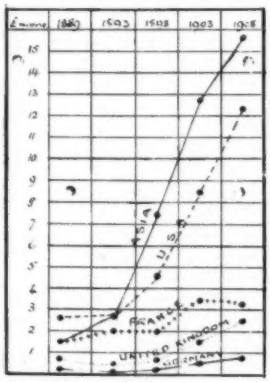
7. *Reference.*—Each sheet is to be numbered and lettered and named. The numbers are to start from 180° E. or W. of Greenwich, and go from 1 to 60 increasing in an easterly direction. The letters A to V are to be used for the zones on each side of the Equator up to 88°, and the letter Z for the Polar Regions. The name of each sheet will indicate the most important place or feature on the sheet. Any sheet or sheets may therefore easily be ordered by its number and letter.

This, then, is the scheme, and an excellent one it is.

Maps as at present published in different countries are drawn on all sorts of projections and on different scales, while their various spellings and symbols baffle description and puzzle the inquiring foreigner. It is to do away with this state of affairs that this congress has set to work. What will be the next step? and how soon will an attempt be made to carry these recommendations into practical effect? The Royal Geographical Society, meeting immediately after the conclusion of the conference, warmly supported the proposals. The general idea seems to be that the British Government will construct a sheet on the lines laid down as a specimen for the consideration of the other Governments. The sooner the better.

The Progress of Japan.

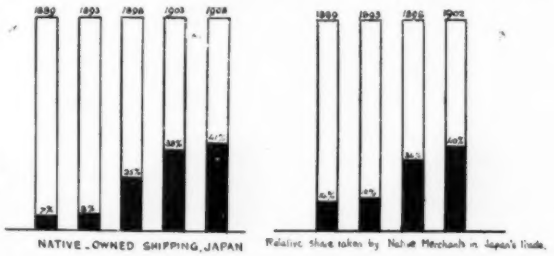
The "progress of Japan" is now something taken for granted, and as little likely to be the subject of dispute as the "roundness of the moon." Some recent figures published in the *Times* help to drive the lesson home, and at the same time to bring commercial geographers up to date. We have reduced to diagram form three sets of these figures. Though they might be left to speak for themselves, a few comments may not be out of place by way of elucidation.



Value of Exports from Japan to Asia U.S.A. France U.K. and Germany during last twenty years

The first diagram shows the value of Japanese exports to five important countries during the last 20 years. As these five monopolise 90 per cent. of the total exports, the diagram is practically an epitome of Japanese export trade during that period. The progress is the more marked when one remembers that before the 'seventies of last century Japan had little or no foreign trade at all. In 1872, the year of her first railway, the total value of all Japanese exports barely touched £1,000,000. Now they are hard on £40,000,000, while the railway mileage is fast approaching, if it has not already reached, 5,000. Of the interesting points in the table, three are worth noting. First is the great advance of what is called "Asia" trade. This means largely China and Korea, the former of which buys nearly £5,000,000 worth of cotton yarn, and the latter the same value of general produce (chiefly manufactures). Secondly, the position occupied by the United States is very high compared with that assigned to ourselves. Two commodities account for it—silk and tea. The United Kingdom buys only £250,000 worth of silk and practically no tea from Japan; the United States takes nearly £9,000,000 worth of silk, or three-quarters of its total imports, from Japan, and £1,000,000 of tea. Apart from these two commodities, the purchases of the two rivals appear to be about equal. Thirdly, Germany's humble position seems to point to the fact that the British outcry of a few years ago against German methods and German traders was premature. A glance at the *import* tables certainly puts her above France, but far below both the United Kingdom and the United States.

The second diagram shows the steady development of Japan's capacity to do her own carrying trade. The figures are percentages of the value of trade carried by Japanese vessels as compared with that carried by foreign boats. Twenty years ago over 90 per cent. of the shipping trade was in the hands of the foreigner; now, the Japanese themselves are responsible for nearly half of it, while the total has advanced from some £13,000,000 to well over £80,000,000. The great growth came in the decennial period 1893–1903. The war



NATIVE-OWNED SHIPPING, JAPAN — Relative share taken by Native Merchants in Japan's Trade.

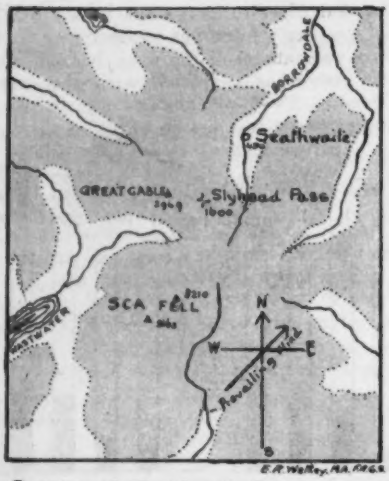
with China opened the eyes of Japan to the advantage of sea-power, and she at once commenced a policy of encouraging shipbuilding, improving navigation, and granting subsidies. As her mercantile marine now enjoys grants of over £1,000,000 per annum in the form of subsidies, there is little wonder at the celerity of its growth. Of all countries Great Britain has naturally felt the pressure of this growth most seriously. At one time we carried the greater portion of Japanese trade; nowadays the gross tonnage of the Japanese boats engaged in the Japanese carrying trade is nearly half as large again as the British.

The third diagram is curiously like the second. It refers to the share taken by the Japanese themselves in the conduct of their ever-increasing trade and commerce. The figures stop at 1902, since when no statistics on this subject have been obtainable. Their share to-day is certainly nearer 50 per cent. than 40 per cent. Here again the totals involved have increased enormously. Twenty years ago native merchants handled about £2,000,000, while the foreigner had £12,000,000 as his share of the trade. In 1902 it was about 19 as compared with 29. This increase of amount has prevented the foreign middleman from feeling any acute sense of a declining business, but relatively he is obviously losing his place, and in the nature of things will probably continue so to do.

Seathwaite and its Rainfall.

The little village in Borrowdale is well known as claiming to enjoy (?) a heavier annual rainfall than that of any other habitable spot in Europe. This averages nearly 150 inches. But a glance at the orographical map naturally raises the question, Why should Seathwaite have such a rainfall? It is to leeward of a great mountain mass, towards and over which blow the prevailing south-westerlies. Surely a greater precipitation should occur on the higher ground to the south-west. The Styhead Pass to the south-west of Seathwaite is 1,200 feet higher, while the mountains in the vicinity of the pass rise up another 1,500 feet.

The explanation is that the vapour-laden air, coming, of course, from the south-west, after being driven up the slopes of the Great Gable and Sca Fell and the Styhead, is still moving upwards and onwards. The



Position of Seathwaite, Borrowdale, in relation to Highlands and S.W Winds

Highlands above 1000 ft

Scale, English miles

mountains of our British hills are not high enough to pass this on as *dry* air. Accordingly it reaches the highest point above sea-level and the lowest temperature to leeward of the mountains. It is there, then, as a consequence, that the maximum precipitation takes place. *Hinc illæ lacrimæ*—for Seathwaite!

N.U.T. NOTES.

BY ALLEN CROFT.

I SUPPOSE that hardly ever was there such an outburst of newspaper jubilation as greeted the publication of the very latest "Syllabus of Physical Exercises." To many of the sapient journalistic scribes the fact that the bodies of the children in our primary schools were looked after at all came as a great discovery; and in a dull season (from the point of view of *news*) they made the most of their new-found knowledge. I have nothing but commendation for the syllabus itself, and the vast majority of representative teachers with whom I have discussed the matter seem to regard the publication as quite first-class. This is the opinion also of the Executive of the Union, who have boldly expressed general approval of the scheme, at the same time claiming, as with other subjects in the school curriculum, "full liberty to adopt the scheme to the needs and possibilities of teachers and scholars." Though men in high places at the Board of Education seem to talk and write much about encouraging experiments and originality amongst the teachers in our schools, there is a feeling steadily increasing which seems to point to the ultimate adoption of Procrustean methods on the part of the Board. There is justification, too, for the impression which prevails; for a recent Circular (727) to Local Education Authorities lays such stress on the desirability of all teachers being trained in the principles and methods of the new course as to suggest the organisation of special classes for teachers on Saturday mornings, and on occasional afternoons or evenings. The usual result has followed in one or two localities, where Education Committees have established such classes and endeavoured to coerce the teachers into attending them. The Executive, of course, are always glad to see members of the Union adding to their extensive qualifications, but have accepted unanimously the principle of strongly opposing all or any attempts at such coercion; and they have caused to be issued a circular to all Local Associations intimating that they are prepared to utilise the financial resources of the Union on behalf of any member who may be penalised for claiming the right to dispose of his private time in the fashion he deems best.

Physical Exercises (1909).

* * *

I DON'T pretend to be a politician, and possibly it is unnecessary for me to disclaim political bias in the writing of these "Notes." I seem to recollect that prominent members of the present Government have in the past laid themselves out to convince the electorate that they are striving night and day to remedy the evils of unemployment, and am tempted to wonder the more whether they know that ours is the only profession which suffers from *State-created unemployment?* Some time ago Mr. Runciman, in answer to a question from Sir James Yoxall, stated that he was not aware that teachers were experiencing exceptional difficulty in securing appointments. At all events, his ignorance must have been dispelled quite recently, when the Board of Education issued a return showing that of the students who left training colleges in July 1908, *two hundred and fifty-nine* were still without employment *twelve months later*. Sometimes I confess to feeling sincerely sorry for the head of a great spending department who has to rehearse the answers to questions in the House of Commons prepared by permanent officials who seem absolutely reckless concerning the use they make of figures. Every one remembers how some two or three years ago the Board of Education promulgated the fatuous prophecy that there would be an immense dearth of certificated teachers in the near future. The nature of the "dearth" is brought home most unpleasantly by the fact that more than twelve hundred of the students who completed their college training last July were still without employment at the end of October, and, unfortunately, likely to remain so for many months more. The irony of the situation is emphasised by the fact that in the session of Parliament just completed, the Board of Education have secured an Act of Parliament empowering them to recover in the Law Courts the amounts expended by the State on a teacher's training should he seek employment in another trade or profession. The time has surely come when the National Union of Teachers should take the strongest possible course to make the fathers and mothers of our brightest boys and girls fully aware of the state of the teaching "market" at the present day.

Unemployment.

A USEFUL BOOK.—Good use can be made by a judicious teacher of oratorical prose passages, and those who use the American method of "recitations" cannot do better than write to Messrs. Collier & Co., 2 Tudor Street, E.C., for a specimen copy of their recently published *Gems of Oratory*, which contains passages by the great speakers from Chatham to his very up-to-date successors.

FAR AND NEAR.

INTERESTING ITEMS FROM VARIOUS SOURCES.

CURIOUS books have at times been put into children's hands, and among the impossible ones are some of the specimens which have in recent years been offered for teaching little folk to read. Such books are published as being good material for enabling children to master very rapidly the difficulties of word-building, and to become within a very short space of time fluent readers. But we know only too well that the English language forbids our relying on one method alone for the teaching of reading. Yet there seem to be people who refuse to admit that our language has innumerable words which are not phonetic. Very many of these words are concerned with the affairs of everyday life, and are being constantly used by children. Other words lend themselves readily to a phonetic classification; but they are rarely used by any one, and are frequently not suited to the children's stage of knowledge. These facts are ignored by those who urge the teaching of reading by phonetic methods entirely. Words, practically obsolete, are dragged in to serve as examples of a particular word-ending, while meaning and common sense are absolutely disregarded. The result is that children, reading from some of the books drawn up upon this plan, are reading an unknown language, one which they neither speak nor hear spoken.—*The Graystoke College Magazine.*

Some Reading Books.

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FROM the above interesting magazine we give the following passage, which occurs in a bright little note on telling stories to children :—

"In these enlightened days it is just as necessary for the teacher to be able to tell a story well, as it is to be able to give a good history or geography lesson; and expert training is as necessary in the one as in the other.

On Story-Telling.

"The learning of stories was never meant to be wearisome, and only becomes laborious to those who make it so; and the trouble taken is well repaid by the appreciation shown at their recital. The spirit and atmosphere of a story can never be brought out so well as when it is told, and the way in which it is rendered constitutes its chief charm. For while a good *raconteur* can make a slight story go down with relish, the best story in the world will fall flat in the hands of an inexperienced narrator.

"As for the 'talking' argument, this is easily confuted; for it is only the trained story-teller who can 'talk' with any safety, and he rarely thinks it wise. Childish imagination is quite vivid enough to respond to any call upon it, without external goadings, and explanations can be done beforehand.

"The literary loss which a story incurs by these interpolations is incalculable. Who is there who can deliver a story with all the literary grace of Hans Andersen from a mere knowledge of facts and incidents in that story? And not one person in a million could tell a 'Just-So' story in Kipling's inimitable style, unless he had first learned that story by heart, for nothing would express the author's meaning so well as the precise language he uses. And just so much as the writer puts into his story must be brought out in the re-telling.

"This can only be done by learning stories, and learning them with the aid of those who have studied them more thoroughly than we can do."

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RATHER more than a year ago a slightly sceptical world learned that Mr. Hiram Percy Maxim had invented and patented a noiseless rifle. A little time passed, and then it was announced that this not too likely story was substantially true; that the new weapon, tested by the military authorities in Paris and elsewhere, had proved to be, from a military point of view—or, rather, hearing—noiseless. And now comes the news that Mr. Maxim has perfected his rifle—has made it smaller and lighter, and even more noiseless than before. It produces, it would seem, a minus noise; it is more silent than silence, and only those animals which tradition credits with the power of seeing the wind could be suspected of hearing it go off. It has been said that the silent rifle will add to the terrors of warfare; but it must be remembered how great a factor the din of battle is in the demoralisation of troops. The mere noise of artillery and musketry is a terror in itself to the unseasoned soldiers who predominate in modern armies. When Mr. Maxim's device is applied to the larger firearms, when even guns of position are reduced to grunting, and field-pieces are scarcely audible at all, we shall begin to get out of touch with the spirit of the old battle lyrics. The child of the future will be taught to recite "cannon to right of them, cannon to left of them, cannon in front of them, muttered and murmured," or that "the battle-whisper broke from them all."—*Daily News.*

Noiseless War.

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I WAS waiting at the drumming-log of the ruffed grouse for the bird to come and perform before me. My place of concealment was in the branches of a fallen dead spruce. I had not been waiting long before a white-footed mouse appeared among the branches on the ground almost under me. It was interesting to see how freely he moved from place to place, appearing now here and now there, all the while travelling under the snow, which had many caverns formed in it by the sun, for it was early spring. Another mouse soon made his appearance, and I watched the two for some time as they searched for food. It was not long before one of the mice was nibbling at my shoe, but the slightest movement of my foot, which was resting on the trunk of the tree, sent him scurrying to the shelter of the branches below. By patient advances, however, I was able to touch the little fellow with the tips of my extended fingers, and five minutes later I was stroking his back as you might stroke a kitten's.—*From "Nature and Science" in December "St. Nicholas."*

A Tame Wild Mouse.

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IN the *School World* a correspondent gives the following excellent suggestions to examiners :—

"An enormous mass of materials is not instructive to the learner."—*Seneca.*

"Erudition is one of the enemies of real education."—*Guyau.*

Advice to Examiners.

"The aim of education is not the production of a

many-sided knowledge, but of a many-sided interest."—*Rein.*

"The true object of education is to instil the greatest number of generous and fruitful ideas."—*Guyau.*

"The teacher's part in the process of education is that of guide, director, or superintendent of the operations by which the pupil teaches himself."—*Payne.*

"When we wish to make young people learn too many subjects, and even these too rapidly, we are overtasking their will and intellect, and we are giving them no leisure for reflection to grasp what they have done, or to prepare for fresh conquests."—*Fouillée.*

"Education is the development in the individual of all the perfection of which he is capable."—*Kant.*

"Knowledge is not wisdom."—*Bacon.*

"The purpose of teaching is to bring ever more out of a man rather than to put more and more into him."—*Froebel.*

"The process of education consists in training faculties."—*Combe.*

A Cheer by the Way.

If the day looks kinder gloomy,
An' your chance is kinder slim—
If the situation's puzzlin'
An' the prospect's awful grim,
An' perplexities keep pressin'
Till all hope is nearly gone,
Jus' bristle up, and grit your teeth,
An' keep on keepin' on.

Fumin' never wins a fight,
An' frettin' never pays;
There ain't no good in broodin' in
These pessimistic ways.
Smile just kinder cheerfully
When hope is nearly gone,
An' bristle up, and grit your teeth,
An' keep on keepin' on.

British Weekly.

THE following is an outside opinion on the Report on the Teaching of English recently issued by the London County Council, with which the Editor hopes to deal next month:—

The L.C.C. Report.

"A report has just been issued by the conference which has been sitting for some time urging a more intelligent teaching of English to those who are themselves engaged in education—that is to say, the pupil teachers and assistant teachers in our national schools. The subject is of great importance, but in vague terms like this it has been dealt with often before. What is most wanted is a system by which the young people of this country will learn to use the English language with lucidity and precision. An old educationist used to assert that the whole matter lay in the short sentence: teach either a child or a man to have a beginning, a middle, and an end to each written or even spoken utterance of his, and you force him to think clearly, and to bring his thought into compass and clear definition. The long, involved sentence which nearly all ignorant people write is not a proof of a complicated mind, but of lack of command over the English language. Clear thinking is the main essential to clear expression. Teach English, and you teach a child to educate himself."—*Country Life.*

I TRUST that no one will misunderstand, or will think that I cherish uncleanliness, when I confess that I deeply regret the advance made by modern science in bacteriology. It is not that I love disease, or fail to share the enthusiasm of those who would banish it, but the knowledge tending to prolong life has made life in many ways so much less worth living that some of us would rather go back to shorter and merrier days. I am all compassion for a piteous childhood, brought up no longer in the fear of the Lord, but in the fear of the germ. A young friend of mine, not long since, told me of her little sister, aged five, who came home daily from the park full of enthusiasm over a new acquaintance made there, a little girl of about her own size. The family, interested, pressed her with inquiries about her friend, very naturally asking her name. The youngster bore the questioning for some time, but at last burst into tears with, "I don't know her last name, but her first name is Dorothy, and she hasn't got any germs!"—*Scribner's Magazine for December.*

Germs in the Mind.

SIR "Claudius Clear" writes brightly in the *British Weekly* on living by rule, and comes to the following conclusion:—

"You lay your scheme for a full day of labour, and some one comes in and breaks it by taking up a couple of hours. How shall we provide for this? There is only one adequate way, and that is early rising. Much though I loathe the practice, I recognise theoretically that it is good, for the great thing is to get a good start. A French writer says: 'Morning work is both the easiest and the most profitable, and, depending as it does upon ourselves, it can be the most regular. To acquire the habit of working betimes is both wise and salutary. Two hours' work before fatigue and worry begin to trouble our minds and disturb our ideas is a hundred times more fruitful than the same time given to work in the evening after the labours of a well-filled day.' This is an exaggeration, but it is on the right side. The healthiest of all literary men, Sir Walter Scott, was accustomed to break the back of his work in the morning, and thereafter he felt that he was his own man."

Early Rising.

DECADENCE in its fullest sense of failure and impotence is now to be found among those who live in the future, not in those who live in the past. We still associate decadence vaguely with archæology, and doubtless there is justification for the idea. I have met distinguished historians and antiquaries, in talking with whom one instinctively remembered that demoniacs always lived among the tombs. But looking backward is not the only form of weakness. Looking forward is, in all our actual experience, a form of weakness too. The futurist does not really invade the future like a conqueror; he only flies to the future as a fugitive flies to sanctuary. In the street of By-and-By, said Henley, stands the hostelry of Never. And, indeed, this is truer than he meant. The love of the untried is truly the love of nothing. Futurism is very near to nihilism. In every practical matter you and I have known, futurism has been a learned name for failure. The street of By-and-By is at the corner of Queer Street.—*G. K. Chesterton in the "Illustrated London News."*

The Worship of the Future.

THE SCHOOL GARDEN.

BY ARTHUR W. BULL.

THOSE of us who have adopted one of the numerous schemes of constructive work must, sooner or later, arrive at the conclusion that the educational value lies not so much in the nature of the work performed as in its correlation with other studies. In the institution of a school garden we have an opportunity of formulating a scheme which, although differing in many respects from woodwork or cardboard modelling, still retains the essential features of the constructive movement, in that it entails practical work on the part of the scholar, and that such work may be closely associated with other studies.

Many now look upon a garden as a necessary and valuable adjunct to school life. The many opportunities which it provides for the development of character, and the refining influence it possesses, must recommend it to all who have the moral and educational interests of the child at heart.

In measuring the land, marking out plots, levelling, and estimating the volumes of heaps of soil, the scholars are materially aiding their mathematics. Further scope in this direction is also provided in weighing and selling, and in calculating the relative commercial values of various crops. Many of the scientific truths learned in the classroom may be verified in the garden. The chemistry of plants, soils, and manures; the process of denudation; the actions of rain, frost, light, and heat, may be illustrated. The difficulties of obtaining specimens of plants and flowers for nature study and for drawing are at once overcome — a well-stocked and established garden providing for these subjects nearly all the year round. The writer was once privileged to see a party of quite small schoolboys at work on a heap of earth. With an energy which can only be compared with that displayed by children building sand-castles on the seashore, they were making quite a creditable relief map of their own county, showing hills, valleys, water-courses, and the like. This, of course, is not school gardening, but it is education, and as such it gives us another argument in favour of its inclusion in the school.

CLEARING THE GROUND.

The accompanying illustrations were taken on a school garden situated within the metropolitan area. This garden was commenced as an experiment, all the work at first being performed out of school hours. As its educational value year by year became more convincing, the authorities gradually incorporated the work with the ordinary school curriculum. In the first place, a vacant piece of land was secured, which had been lying idle for some twenty years. A class of twenty-four boys was then set to work stripping the grass from the surface. This was stacked in a corner for future use. As each boy had to supply his own tools, a most curious assortment was brought into requisition. In two days a quarter of an acre was laid bare, and twenty-four small plots and one larger one—for demonstration purposes—were measured and staked out.

SOWING SEEDS.

Then commenced the laborious task of digging and trenching. Ignoring blistered hands and aching muscles, the lads worked with a dogged determination during two months of early winter, until the land had been laid out to their satisfaction. During this period some fifty yards of road sand and thirty yards of manure were obtained. This the boys wheeled in, stacked, calculated the volume of, and allotted proportionate parts to each plot. Even at this early stage the boys showed marked physical, moral, and intellectual progress. They had a common interest associated with their school, and with their class master who promoted the idea. When they began to see the results of their labours, they early commenced, unconsciously, to cultivate more self-reliance and independence of character. The muscular exercise provided a means of physical development second to none, and the readiness with which those boys grasped the theories propounded in the classroom, and which had any reference to their gardening, proved the utility of the work.

In the early months of the year, when snow and frost made the land unapproachable, seed catalogues were obtained, and the relative marketable values of various crops discussed. As the effort had to a large extent to be self-supporting, each lad was anxious that

his particular plot should produce sufficient to cover expenses. Seed-sowing demonstrations on the master's plot followed, due regard being paid to the depth of sowing, the intervals between the rows, and the positions according to the ultimate heights of the plants. With certain reservations, each lad was then allowed to act on his own initiative. He selected his own vegetable and flower seeds, planted them, and watched their growth as jealously as a child guards its favourite toy.

The fact that a flower and vegetable show was to be held later in the year, when prizes would be awarded for the best plots and crops, formed a special inducement to the gardeners. The sight of the well-kept demonstration plot also imbued them with a spirit of emulation. The success of the venture was never for one moment in doubt. Cut flowers and vegetables were in great demand, and from these sources enough profit was made to cover the cost of prizes, and for the initial expenses of the following year.

Some of the Pioneers.

From an educational standpoint, nothing but good can accrue from practical work of this kind, which may be so closely associated with school work. The failures and the successes of the crops taught their own lessons. That "perseverance wins" and that "carelessness goes unrewarded" are maxims which may not appeal to the youth of to-day when taught theoretically, but the practical lesson of experience is unfailing in bringing those truths home.

THE ENGLISH ASSOCIATION.

The annual general meeting of the English Association will be held at University College, Gower Street, on Friday and Saturday, January 14 and 15. On Friday, after the business meeting, at which the Right Hon. A. H. D. Acland will preside, the president, Professor George Saintsbury, LL.D., will deliver an address on "Shakespeare and the Grand Style." The members will dine together in the evening, when the head-master of Eton College will reply to the toast of the Association.

On Saturday morning the interim Report of the Joint Committee on Grammatical Terminology will be considered, with special reference to the teaching of English grammar. The head-master of Westminster School will preside and open the discussion.

Further information can be obtained from the secretary, Miss Elizabeth Lee, 8 Mornington Avenue Mansions, West Kensington.

AGRICULTURAL EDUCATION.

A SCHEME OF WORK FOR RURAL SCHOOLS.

BY W. FRANCIS RANKINE.

The Chemistry of the Soil.

IN our previous work we have been engaged mainly with considerations of the soil from the physical side; we now proceed to investigate some of the simplest facts as revealed by chemical experiment.

Equipped with the necessary apparatus, which need not attain to any alarming proportions, it is possible in a modest way to deal with the most important ingredients of soil. Some of our previous experiments have already pointed in this direction. The following analysis table, which is especially modified to suit the conditions of work that prevail in the country school, enables one to indicate the essential elements of soil. Further elaboration will occur to the teacher with some chemical training. Experiments for the detection of carbon dioxide, water, and organic matter generally have been given in our November paper. It should be understood that this experimental work is intended purely for senior classes, and that the results obtained are only approximate in value.

From work previously done in connection with the nature scheme, it is known that plants can only assimilate food when it is in a state of solution. This leads to the consideration of *available* food—namely, soluble salts—in contradistinction to *unavailable* food. This soluble food may be termed the water-soluble matter of soil, and can be ascertained by treating soil samples with water. The solution is subsequently evaporated, and the residue represents the water-soluble content. However, by using hydrochloric acid we may determine the acid-soluble matter; this indicates the limit of solubility possible in the soil as determined by its acidity. The acidity of the soil is brought about by the organic acids present in the humus, and it may be determined by using litmus. In the case of peaty soils acid conditions prevail, and these give rise to what is known to farmers and gardeners as "sourness." Such soils are treated with lime, which acts as a base and establishes a neutral state. An endeavour should be made to compare and contrast the chemical natures of several samples taken from cultivated and uncultivated soils. Attempts should then be made to explain the differences with reference to the geological character of the district, and to the physical condition of the region whence the samples are derived. Then observation should be made with respect to the vegetation of the neighbourhood. These records, especially in the case of uncultivated soils, are of the greatest value in tracing the relation that exists between the soil and the plant.

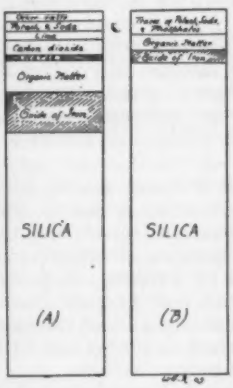
Analysis of the Soil.

Select a sample of soil, weighing from twenty to thirty grams, and free it from large fragments. Treat the sample with dilute hydrochloric acid; filter. The residue consists of acid-insoluble matter; this should be dried and ignited to reveal the quartz grains. To the filtrate add ammonia. A precipitate is obtained consisting mainly of iron hydrate; alumina is also precipitated, but may be neglected. Remove the precipitate to a crucible and ignite; a red substance resembling rust is obtained, and indicates the presence

of iron. To the filtrate add ammonium oxalate; calcium is precipitated.

The results of such an analysis only indicate the presence of the elements named. They do not demonstrate in any sense the value of the foods in the soil, mainly because the analysis is not quantitative. The presence of lime is at once indicated by effervescence after the application of acid. If desirable, the presence of phosphates may be shown by treating the original filtrate with nitric acid and adding ammonium molybdate. A yellow precipitate after gentle warming results.

Fertile soils and barren soils.—Fertile soils contain essentially silica, iron oxide, organic matter, calcium carbonate, potash, and soda in the proportions indicated by the accompanying diagram. A diagram showing the composition of a barren soil is also given for the sake of comparison. Barren soils owe their condition to a high percentage of silica and a low percentage of organic matter or humus, absence of water, and traces of the essential minerals. On account of the low percentage of organic matter, moisture cannot be retained, and, further, the working of bacteria—a subject which, by the way, is rather too difficult to receive more than a cursory consideration—is limited. Since the production of nitrates and the subsequent evolution of nitrogen depend on bacteria, the twofold drawback of a limited amount of humus is easily apprehended. Thus such a soil remains useless until it comes under the cultivation of man, unless the decay of its scanty vegetation augments its humus content. On the other hand, a high percentage of silica allows water to percolate freely through the soil beyond the range of root action.



A Comparison of Fertile and Barren Soils.

A represents the composition of an ideal soil; *B* shows the composition of a barren soil.

From the chemical standpoint humus may be regarded as the centre of action so far as the elaboration of plant foods in the soil is concerned; it is the inner chamber of the laboratory of the soil wherein the material necessary to the plant is manufactured, granted that the raw material is present. To the country folk, whose vocabulary does not include many scientific terms, the humus is known as the body of the soil; and although the cottage gardener is ignorant of its exact chemical significance, he is well aware that it is essential to the fertility of his garden. In excess—as, for instance, is the case in very old gardens—humus promotes coarseness of growth. This illustrates the fact that an even balance of food ingredients must be maintained for the welfare of the plant. The incorporation of lime with such a soil counteracts the acid action of an excess of humus by forming calcium humate. Ammonia is liberated, and thus the excess of nitrogenous food is decreased.

Manures and School Garden Experiments.

It is a single step from the chemistry of the soil to the question of manures; the one implies the other. In the school garden particularly is the discussion of manures peculiarly appropriate; and further, it is possible to elaborate a series of classroom experiments whereby the changes that ordinarily occur in the soil may be shown on a modified scale.

What food does the plant require? This is the first question that presents itself. Eliminating air-derived foods and the subject of starch formation, we are confined to the discussion of those foods yielded by the soil. These consist essentially of nitrogen, potash, phosphates, and lime. It is essential that all of these must be reduced to a state in which the roots of plants may assimilate them. These foods are constantly demanded by all plants in proportions varying with the crop. Thus the soil is depleted by continual cropping, and so it becomes necessary to feed the soil at certain seasons. From time immemorial natural manures have been used for this object, and as a general restorative it has no equal. However, on account of the difference in chemical composition of garden crops, it is necessary to augment the supply of nitrogen, phosphates, or potash as the case may be. Hence the utility of artificial or chemical foods, and hence the necessity of considering the individual need of each crop. The use of these artificials must also be directed by considerations of the soil with regard to their geological derivation. In this way is opened up much interesting work in the school garden, in which trials should be conducted. From these accrue benefits of educational value which are useful to those whose aim it is to improve garden culture in rural districts.

Before proceeding to a specific discussion of the most common fertilisers, the general aim of manuring may be stated thus:—

1. *Physical.*—(*a*) The water-retaining power of soils is increased; (*b*) the tilth of the soil is improved; (*c*) the colour of the soil is darkened. (Compare the soil of a well-manured garden with that seen in adjacent fields.)

2. *Chemical.*—(*a*) The soil is provided with a new supply of plant food; (*b*) humus is replenished.

3. In addition to these changes, it should be noted that conditions congenial to bacteria are secured, although the discussion of these is somewhat outside the range of our work.

The Chemistry of Manures.

The greater part of natural manure is water; one ton of the substance contains about 15 lbs. of nitrogen, 15 lbs. of potash, and 10 lbs. of phosphate. Artificials contain these foods in greater quantities, and for ease of treatment they may be classified as (1) nitrogen manures; (2) potash manures; and (3) phosphate manures. At the outset type foods only should be considered. The following notes set forth the chief points of eachr goup.

1. *Nitrogen manures.*—The best known of these is nitrate of soda. It must be remembered that this chemical is more of a stimulant than a soil improver. The manure is obtained chiefly from natural deposits in Chile. It is used for the purpose of inducing rapid growth, and on account of its solubility it is dusted on the soil during the season of growth. The solubility of nitrate explains the wastage by rain of this valuable food. The main nitrogen supply is derived from humus by means of bacteria, which produce nitrates from organic matter. Plants are unable to draw upon the supply of nitrogen in the air. Attention should be

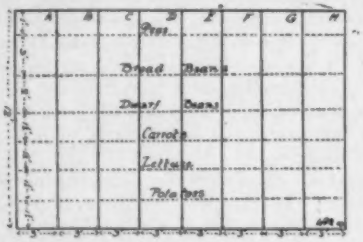
directed to the bacteria nodules which are found upon the roots of the leguminous plants.

2. *Potash manures.*—Kainit is a type of this class. It is derived from the Stassfurt deposits in Germany, and consists of sulphates of potassium and magnesium, together with chloride of potassium and water. It is particularly useful for improving light soils and also peaty soils, and suits potatoes and root crops particularly. The ground is dressed with kainit during the winter months.

3. *Phosphate manures.*—Many forms of this chemical food are in the market. Basic slag may be selected as a type. It is a splendid dressing for soils which are being worked for the first time, and in the case of newly-established school gardens it is especially useful.

Experiments with Manures.

Three series of experiments present themselves—namely, (1) water cultures; (2) pot cultures; and (3) plot trials. Water cultures may be dispensed with since they demand extremely careful preparation, and often the results obtained are bewildering to children. Approximate and at the same time convincing results may be obtained by establishing a series of pot cultures in the classroom. Detail in this matter is hardly



A Cropping Plan for Manure Trials.

necessary. One kind of crop should be grown—wheat and barley are suitable subjects for this work. Each pot should be fed with one kind of fertiliser, and the results, as shown in the development of the plants, carefully recorded. However, these cultures demand more attention than window plants, and therefore they must not be left to themselves.

In the school garden more important work is possible in the form of manure trials. The object of this work should be to determine what form of chemical is demanded by the soil of the district, and to discover the effect of each food upon the crops. For this purpose select several plots equal in area and equable as to condition of cultivation. The actual size of the plots will be determined by the space at disposal. The following outlines of procedure are only suggestive; the dressings may be varied and modified, and granted that data are carefully recorded, the results will be valuable. Some of the trial crops will be abject failures from a dietetic point of view, which only emphasises the fact that failure is useful in the garden if we are aware of the causes that bring it about.

Dress the plots as follows:—Plot A, no manure; Plot B, natural manure only; Plot C, kainit—that is, phosphates only; Plot D, sulphate of potash—potash only; Plot E, sodium nitrate—nitrogen only; Plot F, sulphate of ammonia and sulphate of potash—no phosphates; Plot G, sulphate of potash and superphosphate—no nitrogen; Plot H, sulphate of ammonia and superphosphate—no potash.

The results of these different dressings will be indicated in the appearance of the crops grown on the plots. It is best for this purpose to plant uniform crops throughout. The accompanying diagram indicates a convenient cropping for the purpose. Note the effect of the manures on leaf, fruit, and the plant generally. As a guide it should be kept in mind that nitrogen promotes leaf development, potash improves the root system, and phosphates encourage fruit to form.

When this work is accomplished it will be possible to complete a soil survey as advised in our previous papers. This will comprise the following particulars:—(1) Amount of water in the soil; (2) amount of combustible matter; (3) water-absorbing power of the soil; (4) capillarity of the soil; (5) weight of soil per cubic foot; (6) amount of water-soluble matter; (7) amount of acid-soluble matter; (8) amount of carbon dioxide; (9) amount of humus; (10) crops that flourish on the soil; (11) manures required by the soil; (12) colour and texture of the soil; (13) nature of subsoil and depth of soil; (14) nature of underlying rocks; (15) the general appearance of the vegetation of the district with a list of the prevalent species of wild plants.

A Christmas Morality.*

HERE is a study in contrasts, vivid and striking enough for any thoughtful student of humanity, such as every teacher ought to be.

Down the Strand pours the roaring and unending stream of traffic, the ordinary week-day crowd augmented by the strollers whom the Saturday half-holiday has freed to share in the delights of "town;" and not a few yards away from the bustle and the business, in the Adelphi Theatre, the home of melodrama, an actor holds a matinée audience spellbound by reciting the hard central bed-rock truths of the Christian religion.

In the street the honk of the motors, the rattle of the 'buses, the cries of the conductors and the kerbstone vendors blend in one confused medley, which yet has a subtle attraction to the ear trained by experience to catch the strains of "the still sad music of humanity;" and within the theatre a solemn and very beautiful voice reminds us again and again that "he that saith he is in the light, and hateth his brother, is in darkness even until now.....If a man say, I love God, and hateth his brother, he is a liar: for he that loveth not his brother whom he hath seen, how can he love God whom he hath not seen?" The play is Mr. Charles Rann Kennedy's "The Servant in the House." The author makes no secret of the fact that it is a play with a purpose—namely, to insist in new and unaccustomed surroundings upon facts which we must face now and again, if only to remind ourselves how far our ordinary life is removed from that ideal of brotherhood which is Christianity in essence.

* *The Servant in the House.* Published in book form by Messrs. Harper and Brothers, Albemarle Street, W. Acted at the Adelphi Theatre, London, W.C.

The story which the dramatist uses to point his lesson is ordinary enough, at least in outline. We have a worldly ecclesiastic cursed with eloquence, mated with a still more worldly wife. The vicar, whose name is Smythe, has sprung from the ranks, and has a brother, the man who looks after the drains, whose name is still Smith, and whose motherless daughter has been taken into the vicarage to be brought up as a "lady." A third brother of the family, who is Bishop of Benares, is coming home on a visit, and arriving rather earlier than he is expected, takes up in disguise the *rôle* of "the servant in the house"—the butler, to be more precise—under the name of Manson. The cast is completed by the Bishop of Lancashire, the vicar's brother-in-law, who had his predecessors in Milton's time.

> "Of other care they little reckoning make,
> Than how to scramble at the shearers' feast,
> And shove away the worthy bidden guest;
> Blind mouths! that scare themselves know how to hold
> A sheephook, or have learned ought else, the least
> That to the faithful herdman's art belongs."

With this material, the author preaches as remarkable a Christmas sermon as it has ever been my lot to hear—and I have heard many sermons remarkable in various ways. He satirises snobbery with the biting lash of a Juvenal; he exposes the unspirituality of those who usurp the direction of spiritual affairs, and who think that men can be saved in batches; he upholds the dignity of manual labour, refusing to be baffled with the doubts of Ruskin on this matter; and he resolutely declines to be "nice" in consideration of the feelings of the boxes and orchestra stalls. The "Church's one foundation" in his story is a charnel house full of dead men's bones, and connected with a drain; and the end of the play shows us the repentant vicar ready to join with his working brother in the unsavoury but necessary task of clearing it, and filling it with the wholesome concrete of divinest brotherhood.

The bogus butler's conception of the true Church "not built by hands" makes a piece of fine writing and equally as fine declamation:—

"This is no dead pile of stones and unmeaning timber. *It is a living thing*.....When you enter it you hear a sound—a sound as of some mighty poem chanted. Listen long enough, and you will learn that it is made up of the beating of human hearts, of the nameless music of men's souls—that is, if you have ears. If you have eyes, you will presently see the church itself—a looming mystery of many shapes and shadows, leaping sheer from floor to dome. The work of no ordinary builder!

"The pillars of it go up like the brawny trunks of heroes; the sweet, human flesh of men and women is moulded about its bulwarks, strong, impregnable; the faces of little children laugh out from every cornerstone; the terrible spans and arches of it are the joined hands of comrades; and up in the heights and spaces there are inscribed the numberless musings of all the dreamers of the world.

"It is yet building—building and built upon. Sometimes the work goes forward in deep darkness, sometimes in blinding light; now beneath the burden of unutterable anguish, now to the tune of a great laughter and heroic shoutings like the cry of thunder. Sometimes, in the silence of the night-time, one may hear the tiny hammerings of the comrades at work up in the dome—the comrades that have climbed ahead."

The comment of his brother bishop upon this is an entirely unecclesiastical snort, and an onslaught upon the breakfast sausages. We are, before all else, a practical people.

The conclusion of the play is as "unpractical" as Manson's conception of the true Church. The eloquent and scholarly vicar and his elegant wife are henceforth to consort with the working man—a weird blend of costly oil paintings and reproductions of Old Masters and Chinese vases with terribly soiled corduroys fresh from a faulty drain. A butler who is a bishop, and who calls the Cockney page-boy his "comrade," comes into the grotesque scheme with a dainty maiden who is the daughter of a drunken, foul-mouthed workman capable of better things.

All frankly impossible, of course. But the very impossibility arrests instant attention, and forces upon us the author's obvious retort to his "respectable" critics: "Your present scheme of things is the real impossibility. If this brotherhood of man is impossible, then this is no Christian nation. If social distinctions are so adamantine, then we have wandered far enough from that ideal of austerity which helps so greatly in the building up of a mighty people." And a hearty "Hear, hear" comes from more than one in the audience, the first time I have heard such a thing in a London theatre, usually the home of decorum. Obviously some one has a specific. But it is not my duty in this place to comment upon it. The important matter for my readers as educators is the fact that their life-work is partly responsible for all these interesting phenomena.

I do our author an injustice if I convey the idea that his play is sombre and heavy in its seriousness. It is full of the enforced humour of life, the unconscious humour both of incident and retort. No one is so quietly humorous as the central figure in the play, whose deep interest in real life naturally teaches him to appreciate fully those violent contrasts and incongruities which bring a gleam to the eye, a smile to the lips, and occasionally prompt a hearty, soul-healing laugh. Those of my readers who cannot see the play can enjoy it in the handsome illustrated edition published by Messrs. Harper and Brothers (Albemarle Street, W.), which, for any thoughtful student of human nature, would form an excellent Christmas present or New Year's gift. The dramatic story provides a pleasant relief from the mediocre novel of the present time.

Of course the author has been attacked from outside. It is objected that the ecclesiastical dignitary of the sausages is a libel upon his class. Mr. Rann Kennedy retorts that his wounds are those of a faithful friend. He might also have pointed out that his saintly hero is a bishop also. I have not heard that a deputation of working men has waited upon him to protest against his presentation of the man who looks after the drains, or that an indignant company of boys in buttons have attacked him because the page who assists Manson is addicted to stealing the jam.

Evidently the morality play is not dead. It is, and always has been, a powerful social and spiritual instrument. The dramatic instinct is inherent in human nature, and is now wisely made use of by many earnest progressive teachers. The drama comes into our school literature. It is our duty to show our pupils that it can be enlisted in the cause of righteousness, purity, and good living.

I shall never forget the quiet restraint of the actor, Mr. Sydney Valentine, who took the difficult part

of Manson, nor the blend of dignity and sorrow with which he recited the wonderful passage from the old Hebrew poet :—

Thou givest thy mouth to evil, and thy tongue frameth deceit.
Thou sittest and speakest against thy brother; thou slanderest thine own mother's son.
These things hast thou done, and I kept silence;
Thou thoughtest that I was altogether such an one as thyself:
But I will reprove thee, and set them in order before thine eyes.

The whole presentation struck me, I repeat, as a kind of Christmas sermon, but rather of a tonic than of a sedative character, teaching the great and deep lesson of the relative values of things, and pointing out once again those things which are most worth while; insisting, too, upon the most unpalatable truths which were enunciated again and again by the greatest of all Educators, who came "down to earth from heaven" as a Child to children and as a Man to men.

French Prize Competition.

1. All French translations **must be received not later than January 6, 1910**, and addressed to :—PRIZE EDITOR, Office of *The Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the *coupon* which appears on the Back Wrapper page of the current number. One coupon must be sent for each entry.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of **Half a Guinea** is offered for the best rendering into English of the following extract :—

Les Pingouins avaient la première armée du monde. Les Marsouins aussi. Et il en était de même des autres peuples de l'Europe. Ce qui ne saurait surprendre pour peu qu'on y réfléchisse. Car toutes les armées sont les premières du monde. La seconde armée du monde, s'il pouvait en exister une, se trouverait dans un état d'infériorité notoire ; elle serait assurée d'être battue. Il faudrait la licencier tout de suite. Aussi toutes les armées sont-elles les premières du monde. C'est ce que comprit en France, l'illustre colonel Marchand quand, interrogé par des journalistes sur la guerre russo-japonaise avant le passage du Yalou, il n'hésita pas à qualifier l'armée russe de première du monde ainsi que l'armée japonaise. Et il est à remarquer que, pour avoir essuyé les plus effroyables revers, une armée ne déchoit pas de son rang de première du monde. Car, si les peuples rapportent leurs victoires à l'intelligence des généraux et au courage des soldats, ils attribuent toujours leurs défaites à une inexplicable fatalité. Au rebours, les flottes sont classées par le nombre de leurs bateaux. Il y en a une première, une deuxième, une troisième et ainsi de suite. Aussi ne subsiste-t-il aucune incertitude sur l'issue des guerres navales.

Les Pingouins avaient la première armée et la seconde flotte du monde. Cette flotte était commandée par le fameux Chatillon, qui portait le titre d'émiral ahr, et par abbréviation d'émiral. C'est ce même mot, qui, malheureusement corrompu, désigne encore aujourd'hui, dans plusieurs nations européennes, le plus haut grade des armées de mer. Mais comme il n'y avait chez les Pingouins qu'un seul émiral, un prestige singulier, si j'ose dire, était attaché à ce grade.

From L'Ile des Pingouins, by
ANATOLE FRANCE.

(Do not translate *Pingouins*, *Marsouins*, *émiral ahr*, and *émiral*.—ED.)

RESULT OF THE NOVEMBER COMPETITION.

The prize is awarded to "Clio." (Will "Clio" kindly forward name and address for publication?)

First Class.—Ecossaise, T. V. D., Iota, Leonard, Espérance, Yorick, Galloise, Victorine, Lachtaube, Carraway, Jaune-Rouge, T. C. T., Southchurch, E. C. M., Jennifer, Henrietta, Oyster, Vaurien, Una, B. A., Gorse-blossom, Le chevalier, Tim, Colenso, Moselle, Lotus-leaf, S. Jackson, Paul, Majella, U., Cigarette, Molge, Priscilla, Aroer, Nemo, Saint Andrew, Dinah, Caterthun, Méru, O. J., Charles I., La force, Marguerite W., Pete, F. M. S., Mena, Kram, Aitchteesee, Alys, Harry, Trezise, Wegg, Kim, Sursher, Fidelis.

Second Class.—Phebes, Lectrice, Jota, Camie, Assise, Jean Tobie, G. G. M. R., Tommie, Essex, Fritz, Corrigmorna, Brunswick, Amateur, Rosalind, A. B., Castor, Ecclesall F. G. D., Pinkie.

The name and address of "Oyster," who won the prize in the French Verse Competition, are :—Mr. J. H. Fraser, 22 Warrender Park Terrace, Edinburgh.

REPORT.

Only a few translations of outstanding merit were sent in. This is somewhat unaccountable, as the piece was not a difficult one. *Que vous laisserez crever* was in most instances translated *whom you will leave to die*. This does not do justice to the force of *crever*. *Un sentiment* was in several cases translated *an affection*, but it means a great deal more than this; while *jamais* was translated as *never*. It is here used in its proper meaning of *ever*. A period somehow managed to slip in between *madame* and *Delphine*, but no one who translated as if the period should properly be there has been prejudiced by the mistake.

PRIZE TRANSLATION.

Well, Monsieur de Rastignac, deal with this world as it deserves. You wish to be a social success: I will help you. You will fathom the depth of feminine corruption, you will measure the extent of men's miserable vanity. Although I have studied deeply the world's book, there were some pages still unknown to me. Now I know everything. The more coldly you calculate, the further you will go. Strike without mercy, you will be feared. Regard men and women as you would post-horses that you intend to leave foundered at each station of your journey. You will thus arrive at the goal of your wishes. Look you, you will never be anything without a woman to take an interest in you. She must be young, rich, smart. But if you have a real passion, hide it as you would a treasure. Never let it be suspected, or you would be ruined. You would no longer be the executioner; you would become the victim. If ever you fall in love, keep your secret well; do not reveal it until you are quite sure to whom you open your heart. To ensure in advance this love as yet unborn, learn to mistrust this world of fashion. Listen to me, Miguel (naïvely unconscious of mistake in the name), there is something still more terrible than the forsaking of a father by his two daughters who wish him dead—it is the mutual rivalry of the two sisters. Restaud is well born, his wife has "caught on," she has been presented; but her sister, her rich sister, the beautiful Madame Delphine de Nucingen, the wife of a wealthy man, is dying with envy: jealousy consumes her. She is miles and miles away from her sister; her sister is no longer her sister. These two women repudiate each other as they repudiate their father.

"CLIO."

THE TEACHING OF MUSIC IN SCOTTISH SCHOOLS.

BY R. G. DICKSON, M.A.

THE seventh of the series of Memoranda issued by the Scotch Education Department on the teaching of the different subjects in the school curriculum is devoted to music. It is felt that the educational powers of music, it says, are as yet not fully appreciated and taken advantage of by those responsible for the organisation of work in Scottish primary schools. Of course this is a remark made by the writers of the several Memoranda. Each writer is apt to magnify the importance of the subject he is writing on. That is the great danger. If each subject were taken up as fully as is suggested in the Memoranda, there would be little if any time for anything else. The lack of perspective is very apparent. The practical teacher knows a little better, we hope, than he is given credit for about the relative importance of the various subjects in the school curriculum.

The educational powers claimed for music are that it would promote health, be a means of recreation, develop the sense of hearing, and train the faculty of speech as well as song. At the same time, it would exercise an invaluable influence in the awakening of artistic tastes, the refinement of manners, and the deepening and ennobling of the emotional nature. For school children, vocal music is the only form of musical study that is possible within school hours.

The objects of vocal music are briefly set forth as follows :—

1. The production of a beautiful tone.

2. The perception—that is, the discriminative hearing—of the pitch of tones and of the pitch relations (intervals), and the realisation and reproduction of these, both successively, as in melody, and simultaneously, as in harmony; in other words, the ability to conceive in the mind and execute with the voice what is heard and what is written, and also to write what is heard.

3. The perception, realisation, and reproduction of time relations (rhythm in the narrower sense).

4. The perception and appreciation of form—that is, of the structural proportions and their orderliness and harmoniousness (rhythm in the wider sense).

5. The perception and reproduction of the emotional expressiveness of music in its melodic, harmonic, and dynamic aspects.

Voice production, it is pointed out, embraces two disciplines—the art of breathing, and the art of equalising the voice.

With regard to the art of breathing the following recommendations are given :—

1. Breathing ought to be regularly practised by itself, apart from vocal utterance.

2. If lungs, larynx, etc., are to have free play, it is indispensable that care should be taken to maintain an easy, natural position of all the parts of the body. The pupils should stand erect, with chests expanded and heads well poised, neither bent forward nor thrown too far back. Strain of any kind, with the resultant stiffness, must be systematically eliminated. Unless the posture of the body is natural and graceful, and the expression of the face unconstrained and bright, it may be taken as a sure sign that there is something wrong.

3. The teacher should first explain the process of proper breathing, next exemplify it, and finally make his pupils imitate his example. Inspiration and expiration should be performed to his counting, or at his word or sign of command. Meanwhile, he should watch his class vigilantly, and see that all keep their mouths closed, inspire and expire as directed, and bear themselves naturally and without constraint. Although most faults can be detected with the eye, he will do well to avail himself of the service of his ear, and to move about quietly from time to time, listening for faulty breathing.

The art of equalising the voice presents serious difficulties to the teacher. Some recommendations are given which are considered likely to lead not only to negative but also to positive results—not only to the successful avoidance of what is harmful and ugly, but also to the realisation of what is beneficial and beautiful. These are—

1. Soft singing is a remedy for many evils. It prevents the destruction of the voice, so often brought about by shouting; it secures beauty of tone; and it makes for the equalisation of the registers.

2. The attainment of the last of these three objects is further facilitated by practising scales softly, proceeding from easily sung high notes downwards. Thus the coarser chest notes may be gradually improved by approaching them from the sweet head notes. What has been said above as to the sweetening of the chest notes and the strengthening of the head notes should not be forgotten.

3. Precept is excellent, but it will be greatly bettered by example. It has been truly said that a child's voice is like a bird's, and can be improved by catching the notes of better singers. Example in this instance is less powerful when given by a man than when given by a woman or a child; for, in the first case, the voice is so different from that of the child in pitch, quality, and registers that imitation is difficult. It would thus be an advantage to have at least the earliest instruction given by women. Where this cannot be done, the better pupils, those more naturally gifted and perhaps also longer trained, might be utilised as models for the others.

4. It is most desirable that the teacher should give as much individual attention to the pupils as circumstances allow, and that he should do this particularly with a view to wean them from the bad habits of voice production.

Ear training is the most important branch of musical study, and should be begun at the earliest possible moment, as the study is easiest in childhood and grows in difficulty the longer it is put off. The writer then goes on to state in grandiose phraseology some of his reasons for this very sound principle.

In dealing with what the children should sing, he wishes wholesome songs, music simple, no awkward intervals, no out-of-the-way modulations, and no awkward capricious rhythms, free from vulgarity, and words appropriate to the stage of intellectual development. Folk songs are good, with the limitation that they are simple and well adapted to the physical and intellectual capacity of the singers. An embargo is put on many love songs, upon most drinking songs, and upon all songs that reek of savagery. The songs to be favoured are those that sing of noble deeds and gentle sentiments, of nature as manifested in fields and woods, valleys and mountains, seas and rivers, plants and animals, storm and sunshine, of men's work and play.

On the much debated question of unison singing or part-singing, he says that the total exclusion of part-singing would be a grievous loss, and would sadly cur-

tail the pupil's opportunities of musical culture. It is most desirable that the school should at all events lay the foundation of *ensemble* singing in parts. Unison singing does not do this; nor does the singing of rounds quite do it, useful and delightful as that exercise is. Those who argue against the admission of singing in parts, object to it because the children's voices are forced beyond their natural compass, and because half the class are deprived of the pleasure of singing the melody, and condemned to perform an uninteresting second part. These objections are well founded, but they condemn merely the prevailing conditions. It should be possible to avoid what are undoubtedly evils without a sacrifice of the educative benefits and the keen enjoyment that part-singing is qualified to give. It should be frankly recognised that many of the part-songs now sung in schools are hurtful and ought to be discarded. But part-songs can be written in such a way that an easy compass is preserved. Indeed, they may be so written that it is possible for the singers to exchange the parts, those who have sung the first part subsequently singing the second part, and *vice versâ*; and it is advisable that every pupil should learn to sing the lower part as well as the higher. There is no reason why songs with even three parts should not be made use of, although with a small compass the difficulty of finding a suitable supply becomes greater. In three-part singing it is again advisable that a system of exchange between the singers should be practised, so that each may be accustomed to sing the highest, the middle, and the lowest part.

ANSWERS TO QUESTIONS IN THE OCTOBER SUPPLEMENT.*

Section XII.

1. sin 16° = ·276 cos 16° = ·96 tan 16° = ·287
   sin 35° = ·574 cos 35° = ·82 tan 35° = ·7
   sin 70° = ·94 cos 70° = ·34 tan 70° = 2·75
2. 67° 24′ – 67° is near enough. 3. 43° +.
4. (*a*) nearly 37°; (*b*) just over 53°.
5. Q. 2. Ladder and ground 53° + ladder and wall 37° –.
   Q. 3. ,, ,, 19° + ,, ,, 71° –.
   Q. 4. ,, ,, 67° + ,, ,, 23° +.
6. Q. 5. – 24° +. Q. 6. – 25° +. Q. 7. – 45°.
   Q. 8. – ends, 56° +; sides, 50° +.
7. ·866 mile from the road.
8. 69·28 yards. 9. 7′ 10½″ high. 10. 214′ +.
12. 2° 42′; 5° 42′; 6° 24′; 7° 12′; 11° 36′.
13. 20° 24′.
14. 19·8 sq. inches; 21·4 sq. inches; 23·4 sq. inches.
15. 24 sq. inches; 20·78 sq. inches; 16·98 sq. inches; 12 sq. inches.
16. Area $= \frac{ap}{2}$. $= \frac{ac \sin \beta}{2}$.

Section XIII.

3. 228,500 sq. yards; 47·4 acres; £71, 2s. 0d.
4. 423 yards. 5. 2,200 yards; 825 yards.
6. 575 yards; £95, 18s. 0d. 7. 5·47″.
8. 125°; 85·5 yards; 72·2 yards; 2,530 sq. yards.
9. 1,605 yards 10. 224 yards. 11. 149 feet.

Section XIV.

1. 20·16 lbs. per foot; 484 lbs. approximately; 3·57 cub. in.
3. 108 pupils. 4. 86 pupils; 20·37 %.
5. (*a*) 306 cubic feet; (*b*) 4,352 bricks.
6. 48 cubic feet approximately.
7. £5, 8s. 9½d. 8. 128 lbs.; 39,168 lbs.
9. 10½ cubic yards stone, 5¼ cubic yards sand, 32 2-cwt. bags cement.
10. 3·7 cubic yards stone, 1·8 cubic yards sand, 11 2-cwt. bags cement; 15,000 lbs. per 10′ run.
11. 13,713,600 tons. 12. 34½ cubic feet.
13. 400′, 300′, 240′, 200′, 171½′, 133′, 109′, 86′.
14. 276·48 cubic inches; 6·25 gallons.
16. 225 gallons; 2,362 lbs.
17. 10,800 cubic feet; 6,750,000 gallons.
18. $lb\left(\frac{d+d_1}{2}\right)$ cubic feet; $6{\cdot}25\ lb\left(\frac{d+d_1}{2}\right)$ gallons.
19. 510 cubic feet; 10′ 7½″. 20. 21·46″.
21. ¼″ or ·11″; 2,500 gallons per acre approximately; 11·3 tons per acre.
23. 1060·3 gallons. 24. 192 litres. 25. 25·7 cm.
27. 2·44 feet per second. 28. 12½″ diameter.
29. 144·8 lbs.
30. $\cdot 26\ l/r\ (R + r)\ (R - r)$, l, R, and r in feet.
31. 75¾ square inches.
32. 119·35 hours. 33. ·0145″. 34. ·25 mm.
35. 3,373 lbs. 36. 11·8 square feet.

Section XV.

1. Q = 55½; x = 8·3 cm.; P = 7·9; y = 17·1 cm.
2. 884 ft.-lbs. As 884 : 859 nearly.
3. 120·6 in ft.-lbs.; 40·2 lbs.
4. 2¼ cwt.; ¾ cwt.
5. 4 cwt. at each end; 11 cwt. and 17 cwt.; 23·3 cwt. and 35·2 cwt.
6. 23·25 cwt.; 34·5 cwt.
7. Within 5½′ of the other end.

Section XVI.

1. 3,000 ft.-lbs. 2. 10½ ft.-lbs. 3. 40,000 ft.-lbs.
4. 50,400 ft.-lbs. 5. 2,700 ft.-tons.
6. 56·25 ft.-tons. 7. 86,400 ft.-lbs.
8. 62,500, 37,500, 12,500, 112,500 ft.-lbs.
9. $\frac{wlx}{2}$; $\frac{wl^2}{2}$. 10. 12 lbs. per ton.
11. 696,960 ft.-lbs. 12. 34$\frac{1}{11}$ lbs.
13. 3,520,000 ft.-lbs; 107 horse-power.
14. 220 feet per minute.
15. 4,400 feet per minute, or 50 miles per hour.
16. 10,000 ft.-lbs. per minute; 4⅓ horse-power.
17. 291⅔ lbs. 18. 1·94 horse-power.
19. 3,072 horse-power nearly.
20. 16,427 ft.-lbs. per minute nearly.*
21. 5,632 ft.-tons per minute.*
22. 216·5 lbs. 23. 25·98 lbs.

Section XVII.

1. A line 3¾″ long with arrow head pointing north-west.
2. A line 3 units long with arrow head pointing east, representing 3 lbs. east.
3. (*a*) 9·4 lbs.; (*b*) 11·3 lbs.; (*c*) 12·1 lbs. nearly; (*d*) 12·6 lbs. nearly; (*e*) 7 lbs.
4. String at 60°, 7 lbs.; string at 45°, 9·9 lbs.
5. 8·7 cwt. 6. 125 lbs. 7. 15 lbs.
8. Compression in each rafter 10 tons, tension in tie-rod 8·66 tons.

QUESTIONS BEARING ON COTTON-SPINNING.

1. 53 revolutions per minute.
2. £177, 13s. 0d. 3. 23¼ lbs.
4. 7½″ diameter. 5. 176. 6. 12″.
7. (*a*) 192 revolutions per minute; (*b*) 12½ feet per second.
8. 1,410 yards. 9. £215, 2s. 1d.
10. (*a*) 187½ revolutions per minute; (*b*) 168¾ revolutions per minute.
11. 1$\frac{5}{8}$ %. 12. 14$\frac{7}{8}$ %. 13. 52·8 lbs.
14. 106 yards 2 feet 7 inches.
15. 144, 40, and 16. 16. 23·7 and 26·5.
17. 1$\frac{1}{32}$″, 1$\frac{1}{32}$″. 20. 28.
21. 55½ grains, 33⅓ grains.
22. 580. 23. (*a*) 42·4; (*b*) 50; (*c*) 17$\frac{9}{11}$ %.
24. 158 lbs. 10 oz. 25. 22½. 26. 33⅓ counts.
27. 70 lbs. of 35's and 120 lbs. of 60's counts.
28. 13⅓. 29. 7·75d. per lb. 30. 7·69d. per lb.
31. 1,048. 32. 44 lbs. 10 oz. 33. 33⅓.
34. 14·1 pence. 35. 2,520. 36. 336 yards.
37. 200 lbs. 38. 260 lbs.; 26·3 lbs.
39. 60·7 lbs.; 68 %. 40. 22½. 41. 822·2 yards.

* *N.B.*—Copies of this Supplement can still be obtained, price 3d. each, or 2s. 6d. per dozen, post free.

* In Ex. 20 add weight of cart 25 cwt.; and in Ex. 21 add weight of train 100 tons.

Our Art and Handwork Section.

PAINTERS AND PICTURES.

BY W. E. SPARKES.

XVIII.—CLAUDE LORRAINE.

Imitation and Rivalry in Art.

HOW far may imitation be carried without blame? The answer depends largely upon what each man means by the term. If the imitation is senseless and unthinking, it is a very poor affair. You see a flock of sheep pattering down a country lane across which a tree flings its shadow. As the leader approaches he gathers himself together and springs lightly over the fancied obstacle; and the others, having no sense of originality, one by one follow the lead.

We smile at the absurdity, but a little reflection brings us to a more sober state of mind. The sheepish strain is very marked in man; he follows a lead just as blindly and without thought in the most serious as well as the most frivolous of things. If he is not led, he is often driven, as they drive Norfolk geese to market, by rattling peas in a bladder. And this is true enough in the arts. A fashion comes, heaven knows whence! and all are agog to follow it, or are content to be driven from their set opinion by the bluster of authority.

It is all to the good that the arts are not stable.

XIX.—J. M. W. TURNER, R.A.

Everything is at ebb or flow. This keeps the stream fresh and lively, for however much one may admire the green mantle of a standing pool, that is merely the sign of stagnation and death. And these movements backwards and forwards affect the whole stream; you cannot have ebb and flow at once. The hidden force, whatever it may be, is compelling; and however quiet the times, there is no escaping their tyranny. Environment, political movements, religious revivals, discoveries in science, no matter what, insensibly affect all the arts; and this is the most puzzling of questions—who or what has set this fashion in literature, music, or painting? The stream finds itself moving in ebb or flow. Who, looking at the moon serenely sailing in the sky, would dream that so much strength lay hidden behind that placid face?

"Raglan Castle."—A Study for a Picture.
(Photographed from the First Edition of Turner's "Liber Studiorum.")

Think how the fashions in art change. At one time there is a consuming passion for *colour*, at another for *form;* now classical ruins and high-piled mountains show on every canvas, and then, again, you shall find nothing more startling than a cottage by a stream.

What religious impulse beating along the stream

(perhaps from Wesley and the Revivalists) stirred William Blake and Fuseli to see visions? Why should they, a century ago, have painted earth-spirits and rushing angels in sweeping robes? To-day, we look at these strange pictures with a curious eye, but to their age they seemed appropriate; every young artist worked himself into a fine frenzy, and tried to imagine himself a seer. Here was imitation, often enough sheepish imitation, but eloquent of the times. One can almost read a history in pictures.

Fifty years after Blake and Fuseli, this exaltation had flickered down and was almost extinct. Sir Walter Scott (himself a product of movements abroad) had voiced the romantic age, and painters discarded angels and pasteboard Olympias for knights and distraught damsels, reaching down at last to melodrama, or weak comedy where "motley was the only wear."

It is a fascinating subject. It leads down this path and that to many strange conclusions. Men at different periods are imitating their fellows often unconsciously, but strictly according to law. The most startling changes in art have their deep-seated causes, and the changes work along a settled plan. We can't see it because it is so vast. Buildings are not in their right perspective if we are too near—their vanishing lines are too abrupt; we must get away in order to have a "narrow-angle" view which shall show everything in strict proportion. Then we see the relationships.

The periods of art are ranged along the roadside of time like stately palaces. Their forms are definite; we name them at sight; but from the distance, the small details and ornaments, or even the various parts which depend upon or are built into each other, are not to be seen clearly. We must be near at hand for that. But all the artists, great and small, played their part in raising each building. Look at the massive Palace of Art reared by Michael Angelo, Raphael, Leonardo da Vinci, and the sixteenth-century artists—complete, a new creation; yet it is easy to see how this palace was designed on a plan, with variations and additions, drawn up in ancient times. The Italian art was, in fact, based upon Greek and Roman art. The movement was in the air; every artist became an imitator, in a noble or an unworthy sense—that is to say, he imitated and also added, or he was a mere slavish copyist of the greater men.

At the last it seems as though all artists (and all workers everywhere) are unconscious agents working out a strange pattern. Their changes in fashion, their apparent contradictions, are all to one end; the colours are flung backwards and forwards across the loom, and the design is completed. This is a comforting thought when we find ourselves before some more than usually baffling and outrageous picture. The artist probably counts himself a new force; he would not, as a rule, wish to be called a thread. But he *is*. He fits in his place (even his mad eccentricity is an item); and if we could see his picture with the eyes of the future, we should find it helping as a bright colour-spot to enliven the pattern.

The Victorian age is now complete. There have been curious revivals, curious fashions, curious imitators. How confusing when in the midst of it all! But now we are beginning to catch a glimpse of its peculiar design. Our descendants will see it as completely as we can see the Greek or Roman or Italian school. But how astonishing it would be to them if the woven tapestry were suddenly, at a fairy touch, to break up into its separate woof and warp. A pretty distraction indeed! Here they are; you can pick out the heaps of threads at your leisure, gentlemen. Those? Oh, those bright threads were worked by the early Victorians, those fantastic ones by the pre-Raphaelites, and those others by the men of 1860. All vastly different, you see, and little likely to blend, you would think. But, hey—presto! and behold once more the stately tapestry when they are interwoven.

True, when the threads lay in their heaps, the heaps differed widely from one another; yet there was much likeness to be seen in the threads of each separate heap. But you must whisper this, for each of the threads thought itself made of a new material, in no sense copying its fellows, whereas it was the *dye* alone that distinguished them.

For on all hands we find men whose work is individualistic, but many more men who have no originality of their own, and are content to hide the fact by slavishly copying the stronger man. If Mr. Rackham covers his pages with dainty fairies which hit the public taste, you shall find his style at once parodied by a hundred callow artists fondly trying to deceive others, and themselves, that they are doing something notable. And, unfortunately, the counterfeits are often skilful: an undiscerning public takes them for current coins of the artistic realm.

This is the ignoble aspect of imitation. It debases fine art and brings contempt on an original style. But there is a nobler side to the picture. Autolycus is a contemptible thief, "the snapper-up of unconsidered trifles." There are, however, sterner captains, who claim their possessions by right of conquest. In other words, a man may copy—he must, indeed, whether he knows it or not—from another; but the indispensable condition is *that he shall add to it something from himself*.

I remember seeing a painting by Gainsborough—a copy from an early Dutch painter. It was delightful to see how Gainsborough had unconsciously translated the Netherlander into British landscape. The Dutch peasants were there, but they were become English labourers; the trees had taken on another form; the picture had unnumbered beauties added by Gainsborough to a setting which was already fine in itself. And however gifted a man may be, he must find himself attracted across space and time by natures like his own, and he will absorb their excellence to the furtherance of his own art. He will gather freely, but he will also give generously of his own substance.

Claude and Turner.

The outstanding names in art could be written on a small page. The list would certainly contain two names—Claude and Turner. Both were original men; both had learnt much from their ancestors, and Turner especially from Claude—a Frenchman dead many years before Turner's birth—a landscape artist whose reputation was European, and whose works were the touchstone by which every new artist was put to the test.

No two men could be more strangely unlike. Claude was a placid man, and his calmness is reflected in his pictures. He loved the open air, wandering alone with his thoughts through the length and breadth of Italy, his adopted country. He loved the sunshine.

In an article written some years ago I jotted down a few stray remarks on Claude which still seem to me

A Pastoral Scene. (Claude.)

true of his particular art. "Those who knew him spoke of his endless wanderings about Italy, solitary but happy—sometimes

'At the peep of dawn
Brushing, with hasty steps, the dews away
To meet the sun upon the upland lawn;'

or walking at other times for hours under the stars. In these silences he seems to have surprised nature in her happiest and most careless moods, and to have had the supreme power to catch these states and reflect them in his art.....Claude paints an ideal life, where the peasants are as placid as the streams about them. They live for ever near fountains

'By whose falls
Melodious birds sing madrigals.'

"Their sheep and goats wander at will, unrestrained, browsing at will along the sweet lanes. Even the temple ruins, which peep out from among the trees, seem to have slid to an old age through a smooth life. As the stones fall at long intervals through the passing years they make no sound, for they are thickly enwrapped in growing plants which ease their fall. There is nothing violent, nothing strenuous. Saturn's reign has returned—the age of gold, when nature was always kind and the gods propitious.

"It was not strange that in a land boasting its long history Claude should have found delight in introducing the ruins of palaces and temples, for there is always a charm which comes from human associations. In this 'Pastoral Scene' the artist hints at the decay of human power; the peasants turn their back upon the ruined palace eloquent of a bygone empire buried under the growths which nature spreads with an equal mind over man's proudest works. And yet the scene is the more delightful from the thoughts which flow round the ancient ruin, picturing it again the centre of pomp and majesty."

Claude died in 1682. His landscapes were eagerly collected; and however old-fashioned they appear today, their quiet grace can never grow stale. He had the gift to paint *atmosphere* convincingly.

Turner, born more than a century after Claude's death, found that no greater man had appeared to oust the Frenchman from his honourable station; and as his own powers increased, he felt he had only to surpass Claude to hold supreme sway in landscape. He set himself deliberately to conquer the world.

You may remember, for instance, how Turner challenged comparison by presenting a painting to the nation, stipulating that it should be hung in the National Gallery as a companion to Claude's "Founding of Carthage," that the world might judge whether a British artist had not surpassed the Frenchman in his own sphere.

Not that Turner had any doubt. He knew himself to be Claude's equal; he claimed later to have surpassed him. For he was a proud, perverse man, ardent in temperament—perhaps, towards the end, a little mad, but a brilliant genius for all that. He revelled in gorgeous colour, and, as a colourist, far surpassed Claude. It is doubtful, however, whether, with all his power, he ever painted atmosphere more sweetly than his rival—an atmosphere softening all the asperities and bathing a wide scene in softened splendour.

True, his early art was more quiet and restrained than his later; but as the years rolled on, it grew more and more brilliant in colour, until, at the last, he was totally absorbed in trying to express the prismatic beauty with which the air is charged in the sunshine. His was a more complex nature than Claude's. He had more *facets*, each reflecting a different light. Even when far advanced in his art, he could return to his earlier style and paint placid poems in subdued colour.

Let us look at "Raglan Castle" as a case in point. The original drawing was made in brown tints, and the print is photographed from an exquisite mezzotint engraving by Richard Earlom.

Here, once more, Turner was challenging the illustrious Claude. It came about in this way:—Claude's reputation during his lifetime was so high, his pictures were so eagerly bought up by the richest amateurs, that ignoble copyists, with no originality, but with an eye to the main chance, endeavoured to turn a dishonest penny by painting "Claudes," which they sold to unsuspecting collectors with a long purse.

It became quite a flourishing business. It was very exasperating to find your choicest possession nothing but a fraudulent copy, and Claude was at length compelled to draw up a sketch-book to confound these facile rogues, each sketch containing the main outlines and masses in a broad, free style, and bearing on the other side the owner's name and address. These sketches made up what he called *Liber Veritatis*, the touchstone to test truth. After this, when the innocent dealer whispered to the wealthy amateur that he had bought a Claude at a ruinous price which he was willing to sell in confidence, it was only necessary to compare the painting with the artist's *Liber*, which he kept jealously guarded. A note to the owner soon brought the confounding reply that the original painting was still to be seen in his collection, and the dealer was left to bemoan another industry ruined by a fastidious painter with no charity for a struggling trade.

These business sketches, drawn up to confound knavish tricks, were most masterly. Never were two hundred such drawings seen in the world, and at the artist's death they passed from hand to hand, finding a final resting-place at Chatsworth House, where they are still counted among the choicest treasures collected in an artistic treasure house. They are so powerful, and yet so delightful; it is a liberal education in landscape art to study them. The world clamoured to see them again and again. At length the duke allowed them to be engraved by Richard Earlom, and the published mezzotints were, and are, among the finest engravings in the world.

They were continually flourished in Turner's face. You may (it was said in effect) paint as finely as Claude, but can you equal these in masterly drawing?

Turner had many admirers who continually urged him to produce a similar work. He had no need to guard against fraud as Claude had done, so he determined to draw out a completely new series of drawings. He set to work in his impetuous way, and began to look about for capable engravers. Fortunately, it was the prime age of mezzotinters, all of whom would have been proud to be associated with a painter whose reputation stood so high in landscape. Turner selected one man—Charles Turner (not a relative)—to engrave the series; but after he had completed twenty plates he quarrelled with the artist, who, if the truth must be told, was very wealthy, but a veritable skinflint.

Turner broke off all connection with the engraver, refused even to speak another word to him, and looked about for others.

The collection was named *Liber Studiorum*, or book of studies. They are supremely fine; and as the original drawings as well as proof engravings are to be seen at the National Gallery, it is possible to judge how well Turner was served by his engravers.

They cover many fields. The first number appeared in 1807 with the full title, "*Liber Studiorum*.....intended as an illustration of landscape composition, classed as follows—Historical, Mountainous, Pastoral, Marine, and Architectural."

Claude's drawings had increased his popularity, for by their means it had brought the artist down to the man in the street. His sweet pastoral scenes, with swaying trees rustling in the breeze, with shining water sliding over smooth pebbles, with outcropping granite rocks about which the path turned, with sheep and their shepherds, with here and there a ruined arch or fallen pillar, could all be enjoyed by men who were without any special training in art.

And Turner's *Liber Studiorum* were as fine in another sense; for Claude's *Liber Veritatis* was merely a collection of swift drawings, while Turner's books were original works carefully considered and as carefully engraved. There were seventy plates in all, not by any means of equal merit.

Ruskin's favourite was "Raglan Castle," here reproduced. This is no Raglan Castle existing in fact; but, like most of Turner's pictures, it is composed of many parts gathered industriously from various scenes. "Last and sweetest," said Ruskin, "Raglan, in utter solitude, amidst the wild wood of its own pleasance; the towers rounded with ivy, and the forest roots choked with undergrowth, and the brook languid amidst lilies and sedges."

The composition is simple, but the details are full. Leaves and undergrowth are carefully drawn, as though Turner wishes us to look at large over the fair scene. In many of his paintings there is more concentration; the mind is led by every device towards the central fact. "Raglan Castle," on the other hand, is a quiet, dreamlike scene. The setting sun shines through the ruined windows; the air is full of light; the sluggish water in the moat reflects the trees and undergrowth on the banks above, and creeps in oily darkness under the broken bridge; not a leaf stirs in the still air, whose silence is rendered more eerie by the sudden splash of the water-fowl in the moat, a sound which leaves the stillness deeper than before.

You can easily imagine this to be some enchanted castle round which a spell has been cast. Silence broods over the broken terraces where the peacocks strutted and the pages sang; the calm days come and go without the sound of human steps along the choked pathways. The thick woods are clothed in light; wild growths crowd in the shades and hollows; even the moat is getting covered with widespread leaves.

Small wonder that "Raglan Castle," although only a study, appeals to many men more than Turner's more gorgeous paintings.

THE HISTORY LESSON AND DRAWING.

BY W. H. ELGAR.

V.—THE PLANTAGENET PERIOD.

THOSE who have followed this course so far have probably experienced that much greater interest and care is taken in drawing objects which are studied for their own sake, and not simply for the purpose of making drawings. This difference of attitude has been often made one of the principal points by writers on art when explaining the respective feelings of a true artist and the mere transcriber of visual aspects. And it is just as well if the pupil has a clear notion of these two attitudes; for most likely all of the drawings made for the sake of the object represented will be preserved, however rough and incomplete, while of those made simply for the purpose of cultivating the eye and hand only the very best will be valued at all.

Considerable care has been necessary in selecting objects for the study of the previous periods. This selection is particularly difficult in the period now under consideration, for a great many objects made before Plantagenet times are comparatively simple, and those following it possess considerable detail. In the one case it has been necessary to select the most characteristic; and in the other either the most simple, or to draw only parts completely, leaving the remainder only in block form. The objects of Plantagenet times usually found in museums and churches come between these two groups, not only in date, but in the amount of interest and complexity they possess. Moreover, they all seem equally difficult to draw, and rich in the possession of historical importance.

For the reasons stated above, the selection given here must not be taken either as eminently characteristic of the period, or as exactly typical of what is suitable for young people's study. The writer has simply followed the advice given in the concluding paragraph of our last paper, and "looked around;" and most likely this is the very best thing that any teacher who is in search of historical objects for study can do.

During the two and a half centuries in which the Plantagenet sovereigns ruled this country, native English art, fed but not contaminated by Continental influence, reached, many are inclined to admit, its highest development. The severe, sturdy Norman architecture gradually assumed the beautiful proportions and light, graceful details of the Decorated English style; the simple implements, articles of domestic utility, and weapons became less clumsy, more elegant, and often beautifully decorated; while the dress of the well-to-do, though at times extravagant, tended towards perfection of form, material, and taste.

It would be well to bear these broad facts in mind when selecting objects as examples, so that as far as possible the period may be compared with those already treated, and that ultimately several series of studies would be at hand, illustrating the development of some of the more important arts and industries as well as the habits of the people.

Quite a number of objects as well as architectural features become deeply interesting if we study the table manners of the Plantagenets. It is unnecessary to remind the reader that the master dined in the hall with his

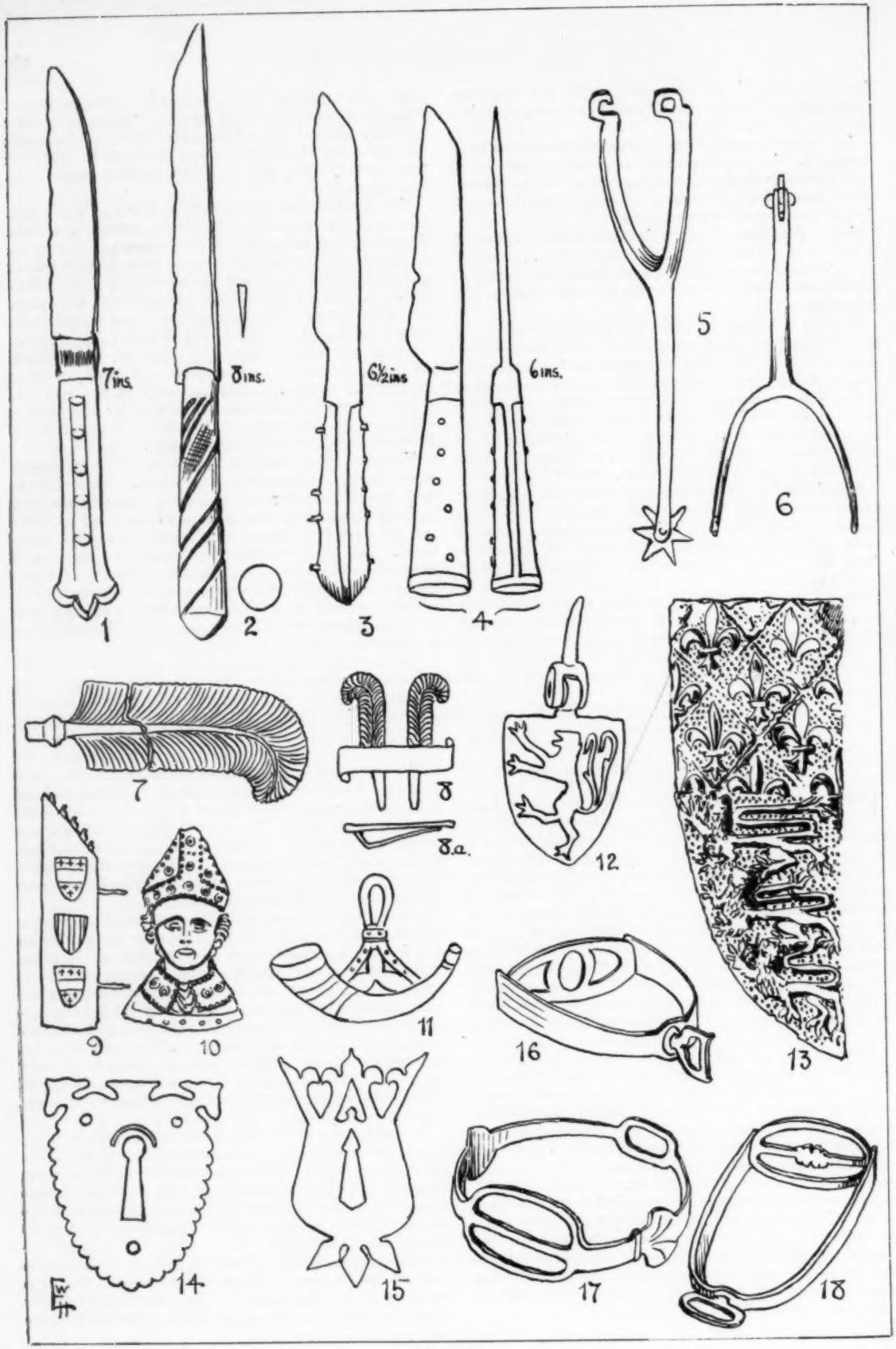


PLATE I.

dependants. Most of the residences built during this period consist of a large common hall, having domestic offices at one end and more or less private and convenient apartments for the family at the other. The sketch plan of the archdeacon's house at Lympne, Kent (Fig. 1), though rather late, shows the usual arrangements. At the north entrance to the hall is a porch with a small room over it. From this porch a passage, made by constructing a screen across the hall, leads straight through to a door opposite, and gives access to two rooms on the east side, which probably were the kitchen and buttery respectively. The portion marked "tower" to the west, together with the shaded part of the plan, no doubt gave accommodation to the owner's family. In the hall the probable positions of the tables and dais are marked by dotted lines.

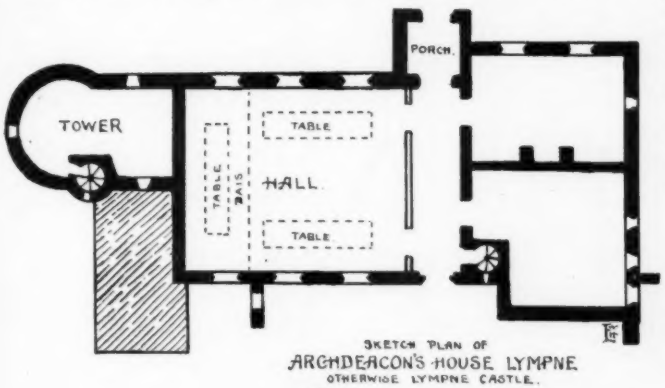


FIG. 1.

As this arrangement of the hall had been practically the same for several centuries, it occurred to the writer, when first drafting these articles more than a year ago, that possibly its origin could be traced to the pre-conquest hut. Two sketches (Figs. 2 and 3) show the construction—namely, two pairs of couples stiffened by struts, supporting a ridge pole (about 5½ yards long), the whole being covered with brushwood. As the entrance was at the end, nothing was more natural than for the proprietor to erect a screen as shown in the sketches, giving a certain amount of comfort and privacy, and accounting for the passage at the end of the hall. The fire is sketched as in the centre, and it is well to remember that the hearth occupies this position in the hall of Penshurst, which was built about 1340. A somewhat fuller explanation of this probable origin by the writer will be found in the *Builder* of February 1, 1908.

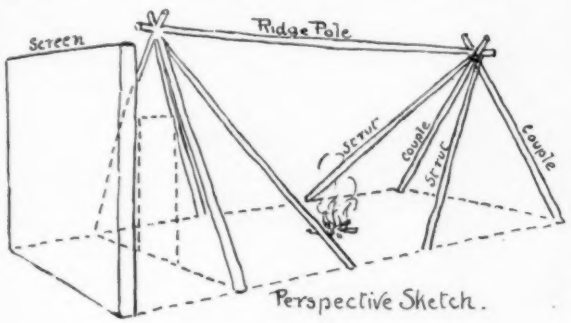


FIG. 2.

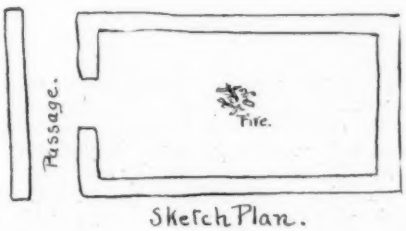


FIG. 3.

Some mediæval knives are drawn as Figs. 1, 2, 3, and 4 in Plate I. They are all more or less pointed, most likely performing double duty, being forks as well. It would seem to be an easy matter to cut meat resting upon pieces of bread with such knives. Figs. 1 and 2 are quite different from Figs. 3 and 4, which are without doubt the parents of modern riveted-handled knives. The rivets of Fig. 3, it should be noticed, are just opposite to the usual way; while the metal butt and the numerous rivets of Fig. 4 may have aided considerably its preservation.

FIG. 4.

FIG. 5.

As the fingers were much more often in actual contact with the food than in modern times, frequent washing was an absolute necessity. This was managed by having water poured over the hands by one attendant, while another held a basin under them. Sometimes the ewers were most fanciful and elaborate. Such a one is that shown as Fig. 4, Plate II., which is in the form of a horseman of the 14th century. This object is made of bronze, and is in the British Museum. It is introduced here both as a ewer and as being a reliable representation of a knight of the period. The basins, too, were frequently most beautifully decorated, espe-

cially those made at Limoges, of the fine enamelled work for which the town was famous. These, however, are quite unsuitable for young children's efforts, so an ordinary fourteenth century basin (Fig. 4) in Canterbury Museum has been included in our illustrations. It is greenish yellow and mottled in colour, glazed, rather thick, and square at the edges, and quite moderate in size, being only about nine inches across the top and three inches deep.

Quite a familiar-looking object is Fig. 5—a pitcher of red earthenware with a light yellow glaze at the top. The simple form of the handle, the elementary lip and general solidity, are evidences of its early date. This example is twelve inches in height.

An early pilgrim's bottle formed one of the illustrations of our last paper. Fig. 6 is a sketch of the well-known costrel, a form common to the period now under consideration. It will be seen that there are two pairs of hollow projections at the sides for a cord or strap to pass through; one is shown in position, and knotted in the smaller side sketch. A better drawing exercise than this to follow a lesson on the Canterbury Pilgrims would be difficult to find. Several children could draw from the same example, and the different views of the projections would give plenty of scope for observation. Many of the costrels of this form are reddish-brown in colour, and rather unevenly and partially glazed. Probably some of it has been removed by age.

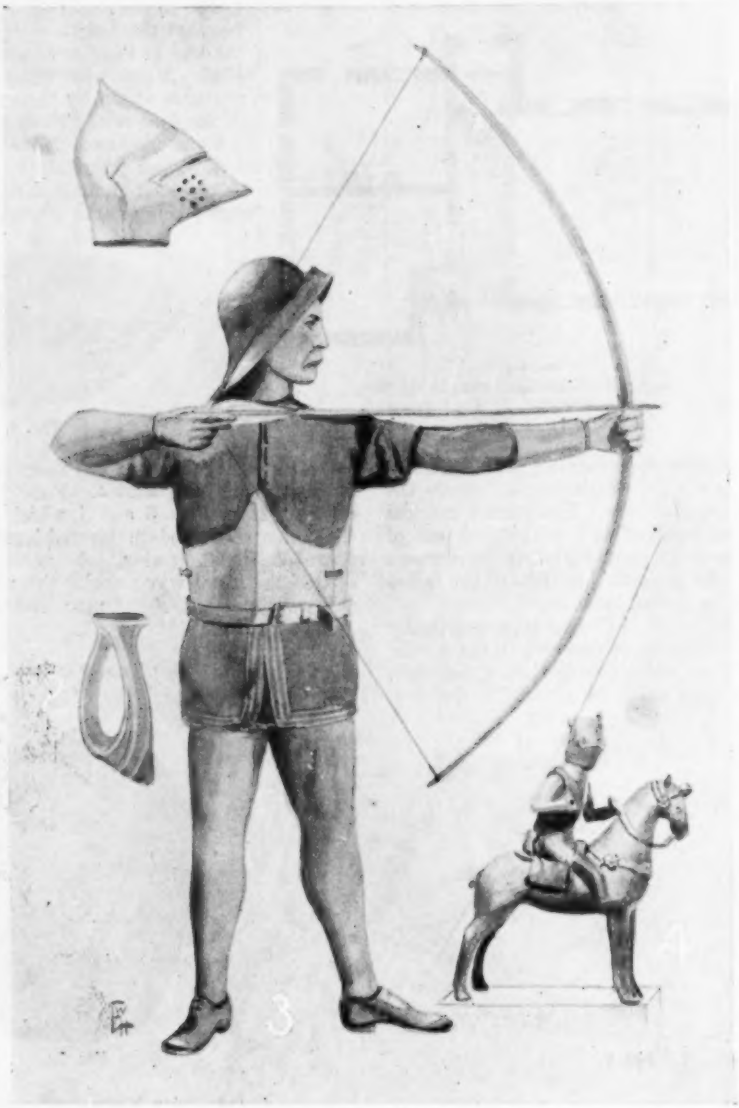


PLATE II.

Other most interesting relics of the religious pilgrimages are the pilgrim's signs made of lead or white metal, obtained at the famous shrines and worn as proofs of the journey. These make good examples for individual

study either in outline or in tone. Figs. 7 to 11, Plate I., are Canterbury pilgrims' signs, drawn approximately of real size; but it should not be forgotten that Walsingham Priory in Norfolk was a very famous pilgrims'

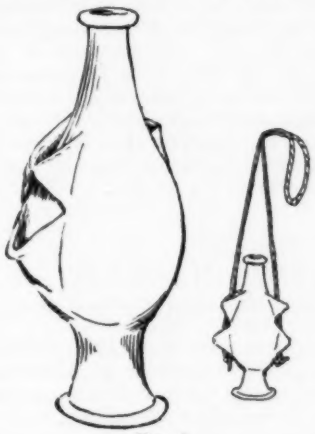


Fig. 6.

objective, as was St. Cuthbert's shrine in Durham. The feathers (Figs. 7 and 8) probably have some connection with the Black Prince, who is buried at Canterbury, and who transformed a part of the famous crypt there from the early Norman style into late fourteenth century style. A sketch looking at the edge (Fig. 8*a*) is given in order to show the pin which secured the badge. Fig. 9 appears to be one of a pair of gates; it bears three shields, and has five crockets on its sloping top. A portrait of the famous St. Thomas is, no doubt, the idea of Fig. 10. He is just as often represented on horseback or seated in the archiepiscopal chair. The designs are very numerous—a lion, bird, spread eagle, fleur-de-lis, cross, shield, quatrefoil, canopied head, portcullis, Agnus Dei, and a circular brooch being noticed in one small collection, as well as those illustrated above.

Another small, somewhat similar object, and most common in the fourteenth and fifteenth centuries, was the armorial pendant. One is sketched as Fig 12, a

Fig. 7.

Fig. 8.

two-tailed lion occupying the whole of the shield. It is interesting to note how the charge is evenly distributed and adapted to the shape of the shield, a point not by any means always attended to in modern work. A half of the Black Prince's shield, which hangs over his tomb, forms our thirteenth sketch. The other half is similar, with this exception—the lions occupy the upper quarter. This is included, not only because of its historical interest, but because it illustrates the point just referred to—namely, the accommodation of the forms of the lions to the spaces they occupy, and the fleurs-de-lis. The irregularities of these latter are carefully copied, and are not the result of careless drawing; but the general richness and interest of these modelled forms are not easily forgotten.

Quite a surprising variety will be found in the forms of the fleur-de-lis if it be studied in different materials and at different dates. Fourteenth-century tiles afford many examples, and are especially suited for children's study. One is shown as Fig. 7, a perspective sketch, giving practice in foreshortening of ornamental forms, a thing often neglected in primary work. Fig. 8 was sketched just as it appeared in the case; but of course a purely geometrical drawing is the easiest way of representing such a design as that of Fig. 9. The slight irregularities, due to the method of manufacture, must,

Fig. 9.

however, be ignored in such work. How far such direct study of geometrical design is from that general ten years ago we leave the reader to judge.

Of the remaining illustrations in Plate I., the spurs call for notice on account of the long shanks and small rowels, and they should be compared with the early prick spur of our last paper. The long shanks enabled the flanks of the animals to be reached under the heavy horse-armour. Figs. 16, 17, and 18 are stirrups in various positions. The forms of these changed with that of the solleret, or foot armour, and the finish of some of them is wonderful. Further study of them had best take place when we come to treat armour in detail; but any one wishing to date such objects is advised to notice the forms of them on monumental brasses, which give most reliable information. The key-hole escutcheons (Figs. 14 and 15, Plate I.) from Ixworth Church, Suffolk, and Westminster Abbey respectively are splendid examples of quite another kind of work.

Plate II. includes a large drawing of the model of an archer in Dover Castle. It is rather wooden in effect, destitute of accidental folds in the clothing, and in the model the bow is not bent. Agincourt was won, in all probability, by the efforts of such men as this model

represents, and the drawing is included because it is very likely much more true in detail than the majority of illustrations found in history readers. The bowl-shaped, wide neck-guarded helmet, called salade, should be noticed, for it is typical of the period. It should be compared with the helm of the mounted figure below. This was very cumbrous, generally cylindrical in shape, and was suspended by a chain to the saddle-bow, for it was only put on at the moment of battle, as it rested upon the shoulders. Sometimes under this a smaller, lighter piece of head armour, the bascinet, was worn. This made stronger, and furnished with a movable visor, ultimately displaced the helm. One of these is shown as Fig. 1, Plate II. The conical visor, affording plenty of room for the face, is secured to the bascinet by a hinge. Behind the archer is a drawing, to a large scale, of a bow-ring. These were used in the East for releasing the bow-string, and were placed upon the right thumb, and probably were used in Western Europe after the Crusades.

It has been most difficult to keep this paper at all within bounds, and it is believed the teacher will be in just such a difficulty when once this searching for objects of historic interest begins, for there is such an abundance that we feel almost ashamed that our eyes have been so long blinded to their existence.

THE EDUCATIONAL HANDWORK ASSOCIATION (LONDON BRANCH).

LECTURE BY DR. T. P. NUNN ON "THE EDUCATIONAL VALUE OF HANDWORK."

A MEETING of the London branch of the Educational Handwork Association was held in November at the rooms of the Royal Society of Arts, when an important lecture on "The Educational Value of Handwork" was given by Dr. T. P. Nunn, Vice-Principal of the London Day Training College.

Dr. Kimmins, who presided, said that he felt decidedly nervous about the success of the meeting, seeing that it was such a gloriously fine afternoon; but the popularity of the subject, together with the reputation of the lecturer, had ensured them their usual good attendance of appreciative hearers.

The lecturer opened by quoting a saying of Dr. Johnson that "everything that was worth knowing about education was known long ago." But they all knew that this was not true; the latest word on education had not yet been said, and particularly was this true about that branch of education with which he proposed to deal that afternoon. Our ideas of what education comprised were constantly changing with newer views of life and newer responsibilities. The point of view was different now from what it was in Dr. Johnson's time. There was, indeed, no cessation in evolution. As long as we had constant changes in our views respecting child life, so long should we have constant material for discussion. That the old views had become obsolete did not necessarily mean that they were entirely worthless. Considering the modern development of psychology, we had, in his opinion, something at least relatively new to add to our knowledge of educational processes. The newer conception of the way in which a child's mind developed had given us a new formula. To educate was to give a child the power of self-expression, and there was no doubt at all in his mind that handwork was self-expression, or, as he preferred to call it, self-development.

Many people fell into the error that there was already existing in a child a *self* which had to be *expressed*. The real meaning of the term was not that of a self struggling to come out. Self-expression was *a movement towards a self* which was all the time struggling to develop.

We had a parallel case when we talked about undeveloped land. There were no streets or buildings, but when we said that land was ripe for development we meant that the conditions existed which rendered it possible to change it from unprofitable to profitable property. So it was quite possible for the conditions to be present in a child out of which a *self* could be developed.

What were these processes? What were the potentialities involved? One was undoubtedly instinct. Some people thought of instinct as something which, while being possessed by all animals, was opposed to reason. He did not wish to use the term in that sense. There were human instincts which produced certain characteristic human behaviour.

Suppose that a teacher left the classroom for a few minutes, and enjoined close attention to work during his temporary absence. Tommy Briggs was working assiduously at his compound addition, but was spoken to by a lazy boy sitting behind him. Tommy naturally left off his work and looked behind him, as we all should; but he found that in so doing he got a pen stuck into his cheek by the naughty boy. This supplied what psychologists called a stimulus. Tommy's soul was at once the seat of the emotion of anger; and it being a well-known fact that a particular stimulus gave a particular response, Tommy no doubt would respond in a particular way, into the details of which it was not now necessary to inquire. Looked at from a psychological point of view, we saw that there were three distinct steps involved in any action—(1) A special stimulus, (2) an appropriate emotion, and (3) a special response. This latter formed what we meant by an instinct, and there was an organic connection between the three steps.

Now the difference between the instinct of an animal and of a human being was this: you always knew the form of response which the animal would take, but you could not always foretell that of the human being. You knew that if you took a bone away from a dog he would be angry, and you knew how he would be likely to respond. But a dog would not be angered by an epigram as a human being might.

If you removed a toy from a young child, he would respond like a dog. He would be angry, and would probably show his anger by crying.

But how could he describe the difference between the anger of a baby and the anger of a man? Take the character of Iago, for example. Inasmuch as Iago was a clever man, his response when offended would be more complicated, his revenge would be more refined, than the response of a child; for in the man the instincts would be immensely developed, and he could think and plot and scheme.

Now it was of great importance for the teacher to study these primary instincts, and from the standpoint of the teacher of handwork there was no doubt that one of the chief instincts to be allowed for was curiosity.

There were what he would describe as positive and negative self-instincts. Did this seem a contradictory statement? Take the case of "Little Jack Horner." He had the positive self-instinct in his soul when, sitting in his corner, he cried, "What a good boy am I!"—exactly like the instinct of a big dog, who knows he is able to lick any other dog. But the negative self-instinct made a person feel his inferiority, as one feels who is unused to hotel life, and who scarcely knows how much to tip that very important person, the head waiter. The positive instinct got uppermost when we grew so thoroughly a Londoner as to be able to order all the waiters about. These two kinds of instincts played an enormous part in the develo,ment of a *self*. Professor Baldwin gave as an instance the difference in attitude of a boy towards his father and mother. Before the father left home for business the boy was humble, obedient, and subservient. After the sterner parent had gone, his attitude towards his mother changed, and from the negative became the positive. He, the lecturer, while recognizing this as an instance in point, would be inclined to reverse the position of the parents.

The instinct of *construction* was a most important acquisition. The youngest child could instinctively make mud pies, and this same constructive instinct could be developed later on, so that the child would take as great an interest in more purely intellectual attainments as he did in his early attempts at modelling. He began with mud pies; he might end with a poem, or a system of metaphysics. Practice should commence on the material plane first, and thus prepare the way for work on the intellectual plane.

But there should be continuity from the kindergarten upwards through the standards. These two kinds of instinct, the negative and positive, would eventually coalesce and combine with the instincts of construction and curiosity. For instance, in a tailor who had thoroughly learnt his trade, these instincts would combine to form the personality of the tailor—that is, the combination had created in him a particular *self*. It followed, then, that men following any profession were people each with a self, the expression of that self appearing in their daily labour. A motor car engineer, to take another example, had the instinct of constructiveness very highly developed. He must also, if he were a real engineer, and not merely a fitter, have the instinct of curiosity. He would, of course, have other instincts as well, but they would all be woven together round the central idea of constructiveness. On the other hand, the scientific man—Marconi, for instance—would have the instinct of curiosity as essentially the central one; the instinct of constructiveness would be secondary. It would be seen, then, that each child had the raw material out of which a self might be eventually developed. In the teaching of handwork we had a process of development of these two primary instincts of constructiveness and curiosity.

1. *Constructiveness.*—Man was a creature born to *make*. It was just as natural for him to do this as it was for a beaver to build; but, unlike the instinct of the beaver, it demanded development. We might begin constructional work with a yielding plastic material such as clay, and in this connection it was well to remember that this occupation was closely allied to art. In fact, it belonged both to manual training and art. A boy should feel a joy in *making;* but in order that this might be so, it was necessary to show him the *need* for some of the typical exercises. It could scarcely be maintained that in making endless repetitions of the wearisome joint, there could be much joy in the work. If, however, the boy were led to feel the necessity for making a joint, it was a different thing. He might be collecting materials for nature study, and by-and-by would see the necessity for keeping his drawings together for reference. Then he should be allowed to make a cardboard portfolio for that purpose. Again, children's hands should be made to serve the brain in other subjects of the school curriculum. Nature study was the beginning of science, and gave an intellectual direction to the young mind. If a child grew the sweet pea in order to study its habits and mode of growth, he would soon find out that the young plant required support. He might then be allowed to make some trellis work, not in the first instance as an ornament, but for actual use. In the teaching of geography the instinct of constructiveness would help us in the acquisition of geographical knowledge. The pupil could make a model of the Polar Regions, and show also the animals which inhabit these desolate tracts of ice and snow. Sometimes, indeed, he might make very wonderful original ones that were not yet discovered by a Peary or a Shackleton. Now what was the object of making these geographical models? Primarily to understand the geography lesson, and not merely to develop the constructive instinct. Yet undoubtedly the one helped the other. There ought to be a more complete fusion between the work of hands and brain. So in the higher classes in practical mensuration and geometry we might have a little elementary surveying, or we might ask the children to measure the height of a tree. They would soon see the utility of some mechanical appliance to help in the measurement of the necessary angles, and so would be able to intelligently construct a sextant or some simple form of theodolite for that purpose. Again, in teaching the principles of mechanics, the boys could make accurately planed lengths of wood to act as beams, and so find out for themselves the laws of balance.

We saw, then, that the guiding principles when dealing with the instinct of construction were—(1) Real interest and joy in the work done; (2) an advance in general knowledge, concurrently with the acquisition of constructive skill; (3) a duly graduated series of articles in order to learn technique.

2. *Technique.*—Our manual training courses of the past had been overrun with technique. The fault in learning the joint, for instance, was that its use was not evident to the boy. It was therefore a meaningless exercise. To the teacher who was a good craftsman its use was, of course, pre-eminent; but we should use technical exercises which should have a *present use* and meaning—not for future use, but for *now*. If we had a new tool to use, in order to make something which could not be made without it, then its use should be justified to the pupils by suitable technical exercises. In dealing with very young children we should use such material as would necessitate repetition in construction, so that no preliminary exercises were required. Such occupations as the weaving of mats and modelling were in this respect suitable for little ones.

There should in this case be no separation between the articles made and technical skill. A little higher in the school the use of cardboard modelling necessitated to some extent practice in technique. The child must be taught to hold the tool properly and to make a straight and clean cut before any article could be constructed. It was, he repeated, in the *doing* of the work

that the child developed his self. As the child grew older more technical development was required.

As a brief summary of the whole handwork course he would say that the constructive instinct, plus the instinct of curiosity gradually developed, should lead up to intellectual and scientific work.

Mr. Rowe, in proposing a vote of thanks to the lecturer, said that to listen to Dr. Nunn was to have the scales removed from their eyes, blinded as they were by looking too closely to syllabuses. He should be glad to adopt the new method, and so to teach as to feel that the child had joy in his work. He thought that the child would *do the thinking* when we gave him an opportunity to *do the work*.

Mr. Boorman wished to ask one question. If it were educational to do no disciplinary exercises with young children, why should such exercises be taken with the older scholars? Would it not be possible for the *whole work* done by children and adults to have reference to the work in hand?

In replying to this query the lecturer remarked that the first thing absolutely necessary was to secure interest in the work, and then afterwards to give such disciplinary exercises as were found by experience to be absolutely necessary if *accurate* work was to be done. In modelling, errors made could be easily corrected; not so in cardboard, where bad technique meant the complete destruction of the whole work, which, instead of being corrected, must be reconstructed altogether.

Mrs. Burgwin (superintendent of special schools for mentally and physically defective children) said that her attention was first called to the value of handicraft by keen observation of the inmates of our lunatic asylums. She observed that these poor, afflicted people were very fond of handling things—they seemed as if they wanted *something to do*.

If she had anything to do with such institutions, she would certainly provide them with some kind of handwork. In *doing* something you first got hold of your child, even though it were destruction and not construction that came first. At any rate it was *doing* something. If you started with the interest of a child, you would afterwards catch his intelligence.

In some asylums she had seen carving that reminded her of the delicate work of Grinling Gibbons, and this by patients who had never handled tools before their mind went. In the physically defective schools with which she was connected the curriculum provided for half-time to be given to manual work, and in her opinion there was just as good intellectual work done in this half-time as in the ordinary school.

The children from fourteen to sixteen years of age were trained in the higher branches of handicraft in order to get a future living. We talked a great deal of nonsense about the dignity of labour, for we did not really believe in it. But the time would come when the teacher of manual training would fully realize that his work was just as dignified as that of other teachers—the time would surely come when the carpenter would walk arm-in-arm with his brother clerk. Dr. Nunn had dignified labour that afternoon by his able address on the principles of handicraft.

The lecturer, in reply to Mrs. Burgwin, said that they would continue to demand that there should be no divorce between manual and intellectual work, and hoped that the time would soon come when the manual training instructor would be regarded as the flesh and bone of the school.

DRAWING IN PUBLIC ELEMENTARY SCHOOLS, DENVER, COLORADO.

BY CHARLES M. CARTER, DIRECTOR.

Fifth Year.

ALL teachers in all years are supposed to have in mind, and to develop as opportunity offers, the habit of judging proportions. The following are points considered. Manifestly they are introduced gradually. A.—*Distances*, comparing height with width. Distances of a point from the sides of a drawing, from the top and bottom; of one point from any two others in the same straight line. B.—*Areas*. Where are areas similar in size and form? what proportions to each other? C.—*Other considerations*. What points are in the same straight line vertically, horizontally? What imaginary triangles or rectangles would be formed by joining points? What lines, real or imaginary, give movement of parts? Where do produced lines cut the drawing?

First, draw after judgment. Second, test by judgment. Third, test by mechanical means.

"Special exercises are a particular feature in the third to eighth years inclusive. One is given each month in each year, except in years seven and eight, when four only are given during the year. The idea is to obtain from each pupil an acceptable drawing or painting. If the first production is not satisfactory it is to be attempted again, and even a third time if the teacher thinks the pupil has not done as well as possible for him. It is desired to cultivate on the part of each pupil persistence in doing the best of which he is capable. The work is judged rather by the effort it shows than by its technical perfection. Pupils are allowed considerable "freedom of expression." The aim is to have these special exercises cultivate greater painstaking without in any way restricting freedom. The best expression by drawing or painting is undoubtedly that which follows careful observation. Envelopes are provided for these exercises, and they are subject to special inspection by the director of art. (Fig. 3, Plate I.; Fig. 5, Plate II.)

Christmas work in all years is made the occasion for arousing special interest in drawing, painting, and the construction of Christmas presents. Such work is generally confined to December. Sometimes, however, drawings preliminary to construction are made in November, to allow for construction in December, before Christmas. Calendars and blotters are often the subjects (Figs. 4, 5, and 7, Plate III.). If a cardboard box for small objects is selected, it may include printing the words "Pens," "Postage Stamps," etc., using wide surfaced letters.

Illustrated booklets are frequently made in the various years. They are used in collecting illustrations from newspapers and magazines. These are arranged taste-

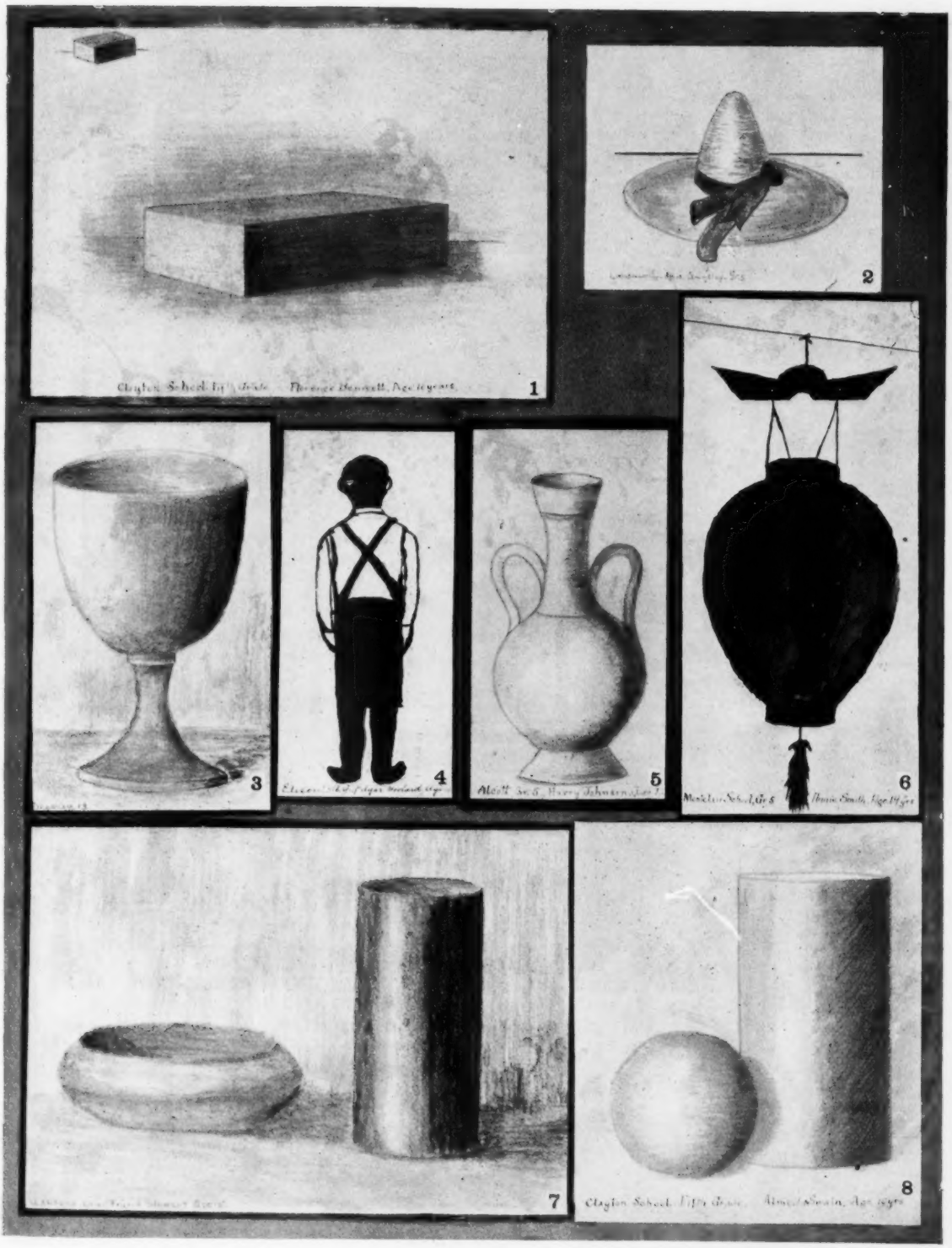


PLATE I.

PLATE II.

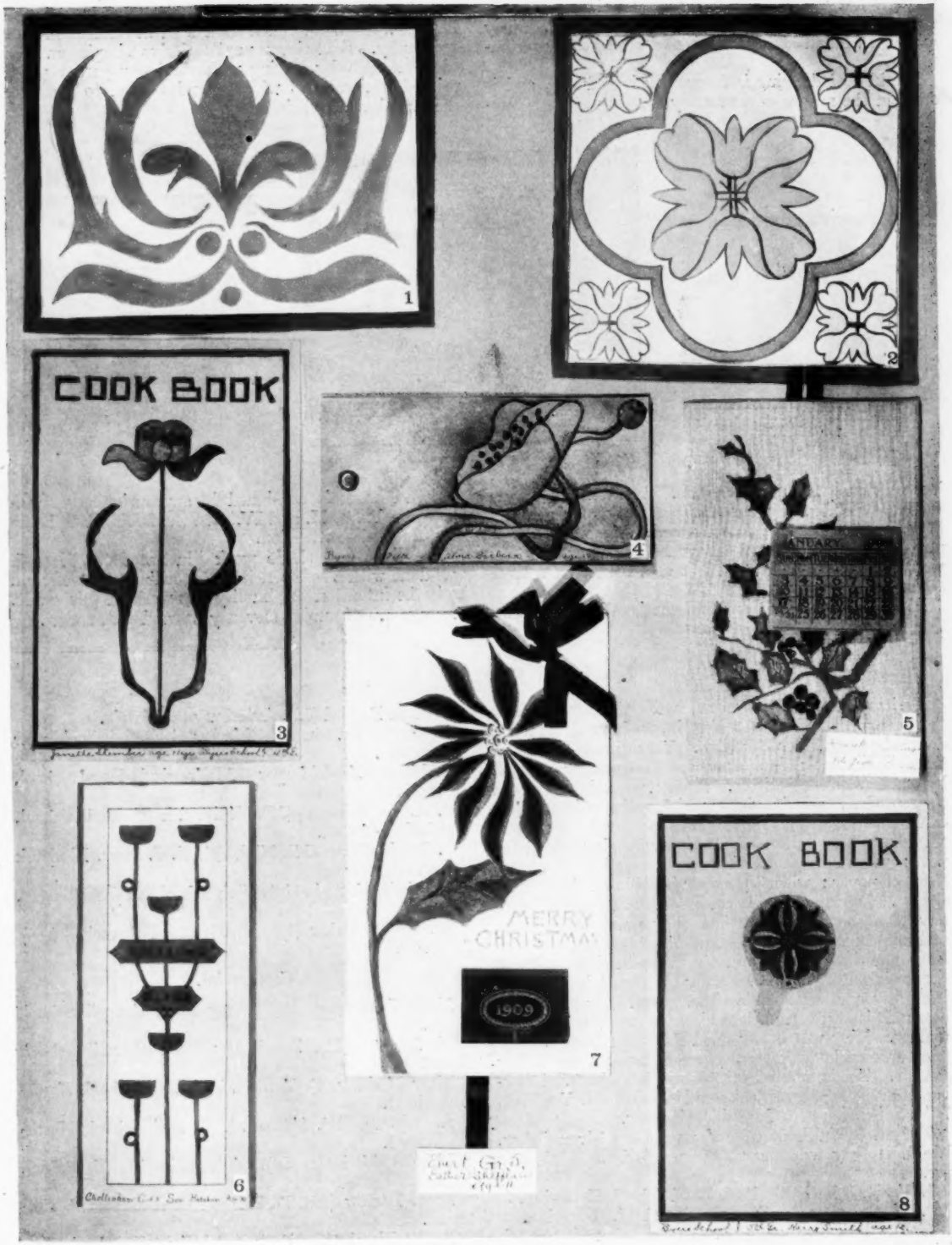


PLATE III.

fully to represent some subject, as "convergence," "model drawing," etc. A specially-designed cover is always included (Figs. 3, 6, and 8, Plate III.). They have been found highly useful, and are strongly recommended.

Blackboard drawing is frequently introduced, and is often in the nature of a memory drawing of some subject previously studied with care. An attempt is made to place the drawings so that the work of the entire blackboard appears well composed. Sometimes ornamental forms are made of the same size at regular intervals, so as to produce the effect of a border on a large scale.

Landscape work is attempted occasionally in the classroom, as shown on Plate IV. Some work has been done out-of-doors, under direction of the teacher. Fig. 2, Plate II., shows an illustration used in connection with geography. Sometimes pupils derive simple outlines of landscapes by tracing with semi-transparent paper printed illustrations, which permits them to see only the most important lines.

PLATE IV.

Nature work is continued in appropriate season as shown on Plates II. and IV., and the freehand alphabet receives further attention.

The light and shade work illustrated by Plate I. was done with a soft pencil in the ordinary schoolroom. It is the intention to simplify this work in this grade. Average age of pupils, eleven years and six months.

HONOURS PAGE.

IN view of the festive season, and of the large number of excellent drawings sent in, we have this month doubled the number of prizes. There are still two or three important points that are constantly neglected by teachers or competitors. It is our invariable custom to reproduce all drawings which gain prizes. This cannot be done when the drawings are too faint; when they have been crumpled up through being folded for post; when several drawings are straggling all over a sheet of paper; when the paper itself is cut into fancy shapes. Drawings to be successful must not violate any of these rules. Further, they must be original, and not copies, however good. The standard of excellence can be judged from the reproductions. About six or eight drawings are usually quite sufficient to send from any one school at a time. Send only your very best; it is of no use increasing the work at this end unduly. We want a few good drawings from a large number of schools, not a lot of drawings from a few schools. The large town schools still hang back. Drawings may be sent at any time addressed to J. Vaughan, 7 Campside Crescent, Langside, Glasgow.

The successful competitors' names are given below. We hope they will receive their awards as Christmas presents.

1. Fred. G. Ball (13), Park Road School, Kettering.
2. W. Sumpter (12), Park Road School, Kettering.
3. Kathleen Redman (13), Drayton Council School, West Ealing.
4. Reginald Good (12), Sulyard St. Council School, Lancaster.
5. Tom Pollard (12), Aylesbury St. Mary's.
6. George Burton (12), Harley Council School, near Atherstone.
7. Horace Ford Harper (13), Trewirgie Boys' School, Redruth.
8. A. Stephenson (12), Tillmouth Council School, Cornhill-on-Tweed.
9. David Sharp (14), High School, C. Class, Elmbank Street, Glasgow.
10. Colin H. Stein (14), High School, Elmbank Street, Glasgow.
11. George Usher (12), Mantle Road Council School, Leicester.

Commended.

Lizzie Lowe (13), Boothferry Road Council School, Goole.

M. Leggott (11), Boothferry Road Council School, Goole.

Mary Holiday (9), Tillmouth Council School, Northumberland.

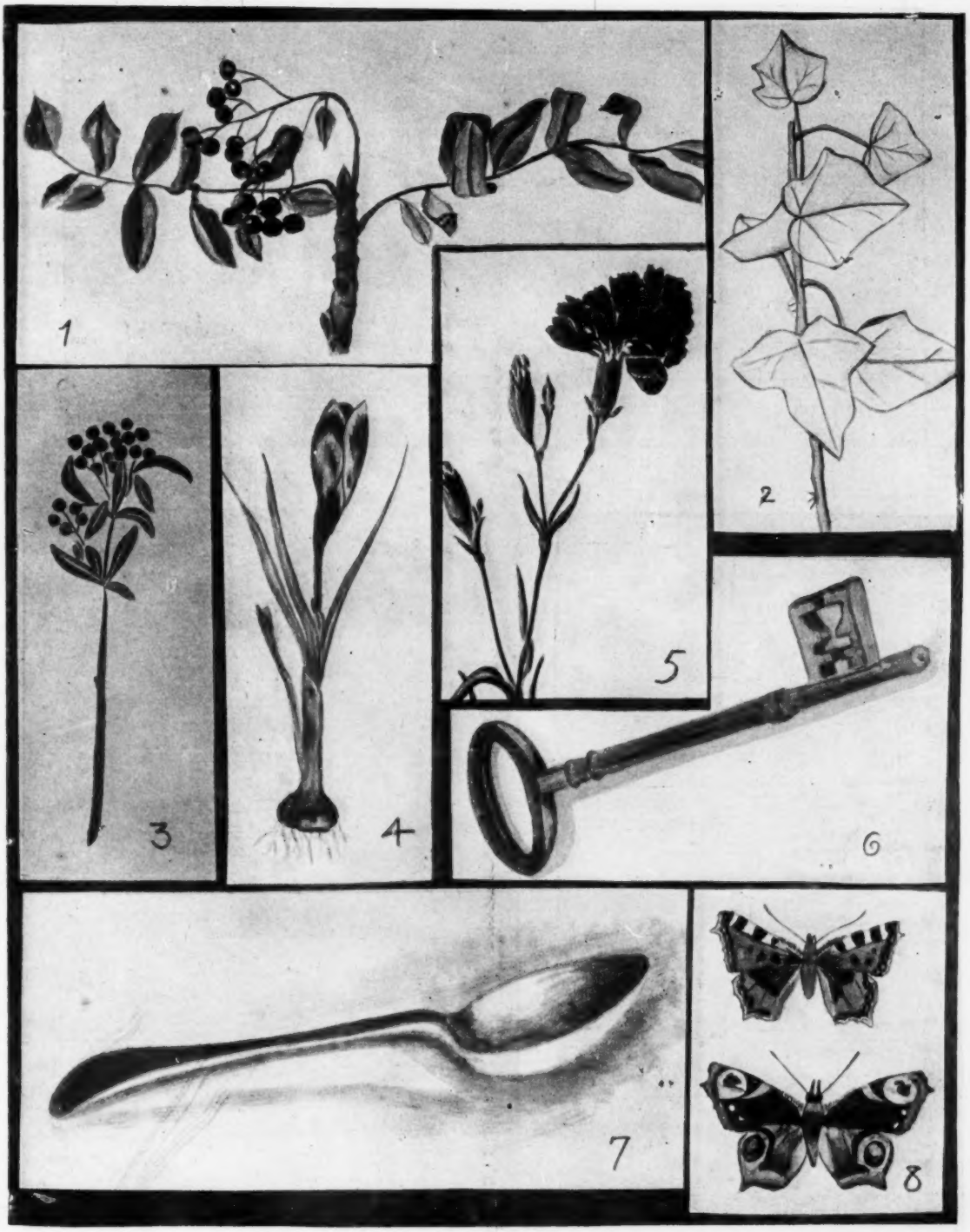
A. Kirkup (11), Tillmouth Council School, Northumberland.

Isabella Holiday (12), Tillmouth Council School, Northumberland.

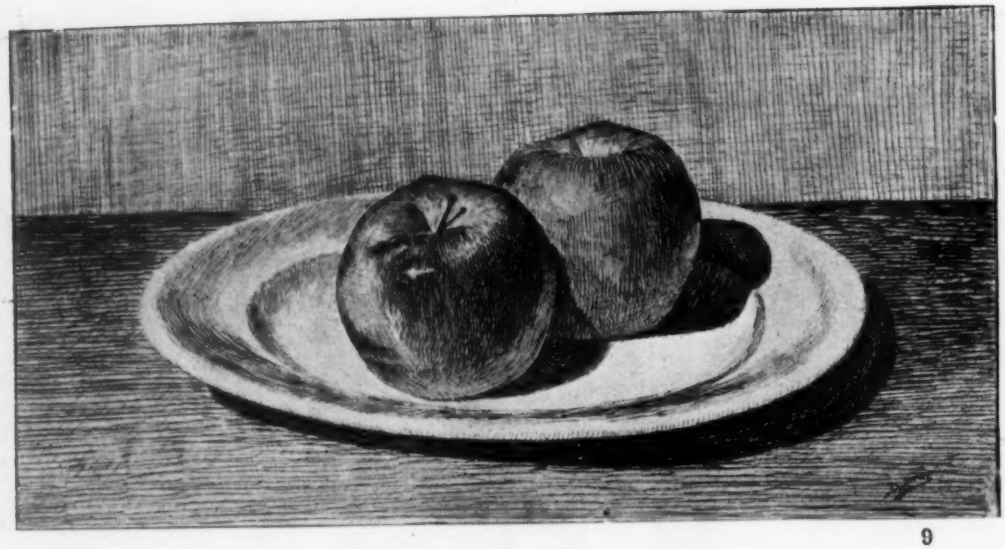
Fred. Barlow (12), Park Road Council School, Kettering.

Frank Bland (13), Park Road Council School, Kettering.

Alicia Griffiths (14), Higher Elementary School, New Brighton.



John Wilson (13), Beith Academy, Ayrshire.
Alfred Varley (13), National School, Lightcliffe, Yorkshire.
Alfred Barker (13), Wesleyan Day School, Barnsley.
Ada Berryman (11), Drayton Council School, Ealing.
Dorothy Catton (11), Drayton Council School, Ealing.
Dorothy Kay (10), Drayton Council School, Ealing.
Alice Yates (14), Drayton Council School, Ealing.
John W. Yates (12), Park Grove Council School, York.



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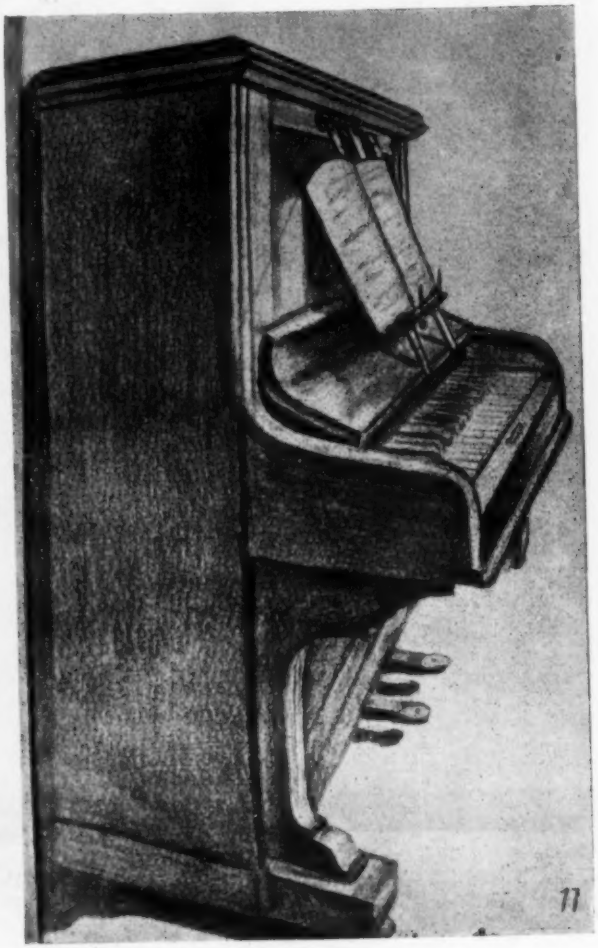


10 HONOURS PAGE.

CARDBOARD MODELLING.

BY FELIX T. KINGSTON, BARRY.

Model No. 4.—A Hexahedron.

TO be covered. The development is shown in Fig. 4*a*. The drawing and scoring present no new difficulty. When fixing begin with flap X, then fix Y.

Choose a plain paper for covering. Cut a rhombic piece large enough to cover the two faces ADB, CDB (Fig. 4*b*) and to overlap the four adjacent faces about $\frac{3}{8}$".

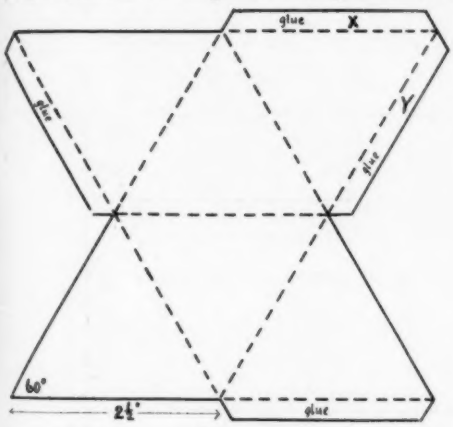


Fig. 4*a*.

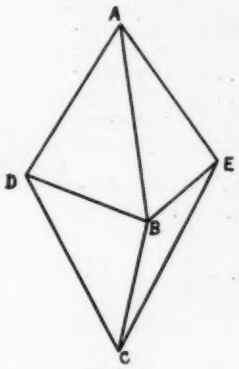


Fig. 4*b*.

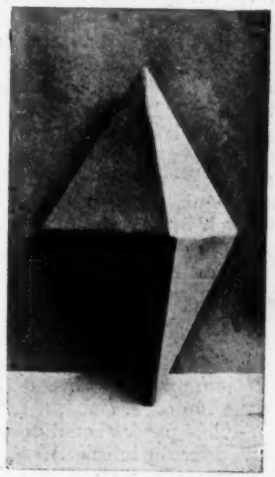


Fig. 4*c*.

Next cut another piece for the two faces ABE, CBE (Fig. 4*b*); this piece must fit exactly along the edges AB, BC, and overlap the faces ADE, CDE $\frac{3}{8}$". A third piece of covering paper may now be cut to fit exactly the remaining two sides.

The fact that this model has oblique faces makes it more difficult to cover than the preceding model, whose faces are perpendicular to each other; but the amounts of waste to be cut away when folding the margins of the paper over adjacent faces can easily be found by trial.

As an alternative to the present exercise, the teacher may select a pyramid, or an octahedron, or an oblique prism, etc.

Model No. 5.—A Box.

This model may be made to serve as a pencil-box, in which case the dimensions given in Fig. 5*a* will be suitable. But here, as in most other instances, a little modification of dimensions will suffice to adapt the box to some other specific use. Much will be gained by letting pupils choose their own measurements and adapt the model to suit their own wishes.

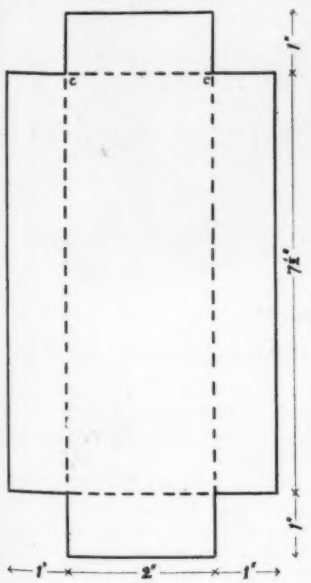


Fig. 5*a*.

Fig. 5*b*.

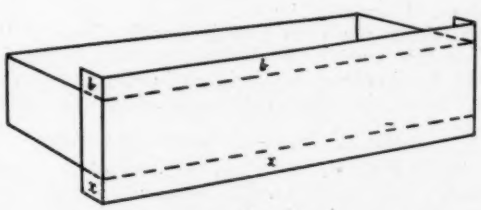


Fig. 5*c*.

Fig. 5*d*.

Note that flaps would here be a hindrance; the corners will therefore be fixed by means of strips of plain linen or calico binding. The most effective method is to apply seccotine to the cardboard, and not to the calico. Before bending the sides of the box into position cut off a piece of the binding 1″ long, and fasten half of it to one upright edge. Repeat this at the other corners. Now bend the sides into position, and fix similarly the remaining halves of the cloth.

Cover the box with a decorated paper thus:—1. Cut a piece of paper $8\frac{1}{4}'' \times 2\frac{3}{4}''$ for the bottom (interior). This will cover the base, and allow a $\frac{3}{8}''$ lap to fasten to the sides. Remove a piece $\frac{3}{8}''$ square from each corner (see *x x*, Fig. 5*b*) to allow the paper to fit into the corners of the box. The piece is now ready for pasting and fixing. The success of the process of fixing lies in delicately placing the gummed covering paper into the box so accurately that the points *c c* (Fig. 5*b*) are exactly superimposed over the points *c c* (Fig. 5*a*). Work the paper well into the interior edges with the finger-nail or the back of the knife, so that the model may preserve a clearly defined form.

2. Cover two opposite sides (exterior)—for example, a piece $8\frac{1}{4}'' \times 1\frac{3}{4}''$ will cover one long side, and allow $\frac{3}{8}''$ to overlap all round. Fig. 5*c* shows the strip placed in position for folding. The margins at *x* fold over on to the bottom exactly as in Model No. 3; those at *b* fold over the top edge, and fasten to the inside of the box. (*N.B.*—This paper should be of different pattern from that used for the interior.)

3. Cover the remaining sides (exterior). A piece $2'' \times 1\frac{3}{4}''$ will cover one end, allowing a margin of $\frac{3}{8}''$ to overlap the base and the interior. Do not omit to mitre the ends of the marginal pieces where they overlie others.

4. Cover the base (exterior) with a piece $7\frac{1}{2}'' \times 2''$, taking care that it does not project beyond the edges of the base.

5. Cover two opposite sides (interior). A piece $8\frac{1}{4}'' \times \frac{15}{16}''$ will suffice for one long side, and allow $\frac{3}{8}''$ to overlap the ends. As before, work the surplus margins well into the corners. The covering paper for the sides is not intended to reach to the top, but to allow about $\frac{1}{16}''$ of the exterior paper to show all round the top edges. See photo, Fig. 5*d*.

6. Cover the ends (interior) with pieces $2'' \times \frac{15}{16}''$. Note that much time will be economised by cutting at once a strip of paper $\frac{15}{16}''$ wide and about 21″ long, which will be sufficient to cover the whole of the sides (interior).

Model No. 6.—A Stationery Case.

To be covered. This is a variation of the preceding model, being simply a deep narrow box with irregular upper edges. The drawing (Fig. 6*a*) gives dimensions of a case to hold postcards.

Use calico strips for fixing the edges, as in No. 5.

The process of covering is the same as that prescribed for the previous model, except that the paper for the bottom (interior) cannot easily be placed in position owing to the narrowness of the box. The difficulty is best surmounted here by covering the bottom immediately after scoring and *before* fixing the sides of the model together; but in such cases the covering paper must be cut exactly to size—namely, $4\frac{1}{2}'' \times 1''$—allowing no overlapping margins. For the rest, follow the order given for No. 5.

The rectangular mat ($5\frac{1}{2}'' \times 2''$) forming the stand will next be made—a repetition of Model No. 1, which see for directions.

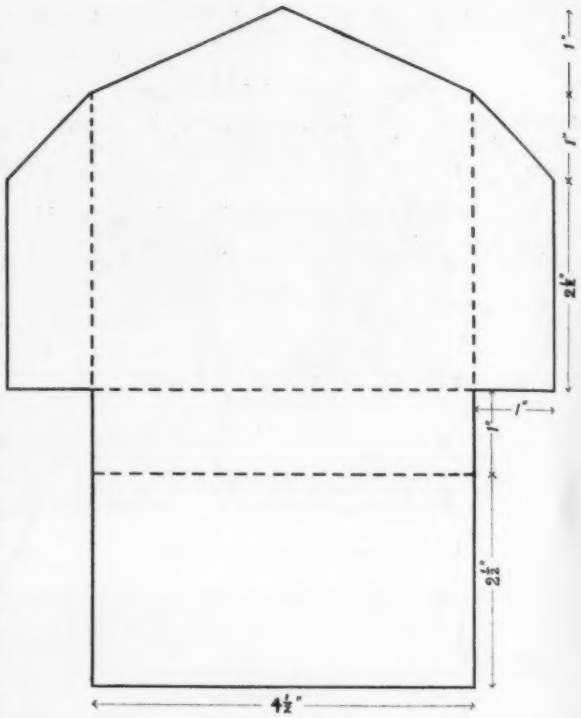


Fig. 6*a*.

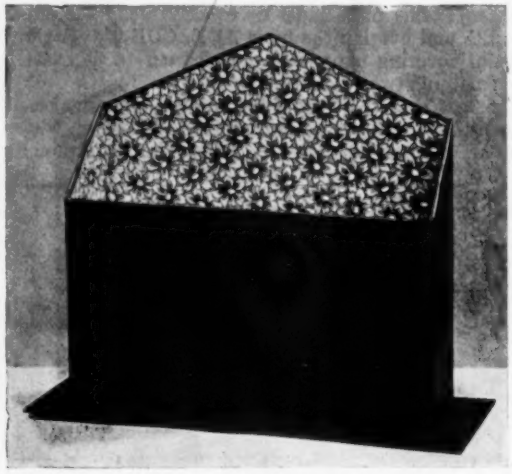


Fig. 6*b*.

Fasten the two parts of the model together by gluing the base of the box.

Model No. 7.—A Box with Simple Lid.

The development is given in Fig. 7*a*, both dimensions and form being suggestive only.

As a variation in the kind of ornamentation the exterior edges of this model may be first bound with cloth; the covering papers will then be cut so as to allow about $\frac{1}{8}''$ or $\frac{1}{16}''$ of binding to show all round. This will serve to recapitulate some of the methods used in the previous stage.

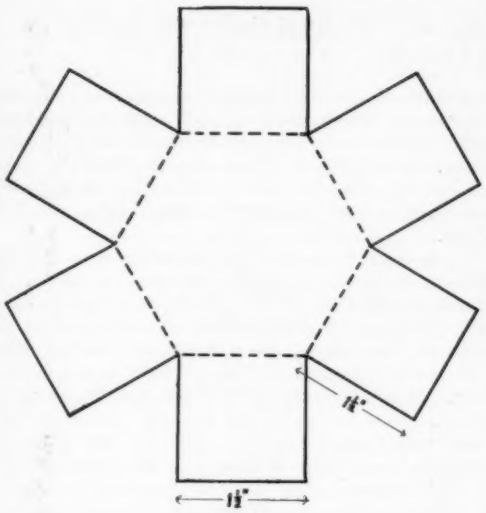


FIG. 7a.

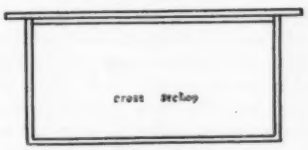


FIG. 7b.

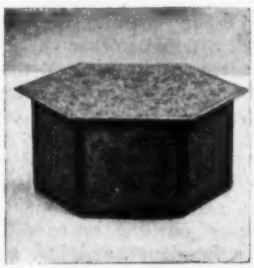


FIG. 7c.

The lid is made of two pieces of card glued together, the lower one being of the same size as the base of the box (or rather less, because it should fit somewhat loosely into the box), and the upper one large enough to form a flange of about ¼" all round (see Fig. 7b). Bind the edges of the upper piece (see Model No. 1 of previous stage), and cover both sides. Cover one side only of the lower piece. Then glue both pieces together. (*N.B.*—For the upper piece use paper of same pattern as that chosen for covering the exterior of the box; for the under piece use paper of same pattern as that chosen for the interior.)

MODEL NO. 8.—A BOX WITH HINGED LID.

See Fig. 8*a* for development. The model may be bound or not, as in previous exercise, before being covered.

This exercise introduces the making of a hinge. The process will be understood from reference to Figs. 8*b* and 8*c*, which show an enlarged section on AB (Fig. 8*a*). The two pieces of card to be hinged are placed side by side, but not touching. Two strips of cloth are placed along the juxtaposed edges, one above, the other below (8*b*). The cloth is then pressed (with the back of the knife, say) successively from both sides till both pieces meet and fill up the hollow (8*c*). The distance through which the lid will revolve depends on the space allowed between the two pieces of card when the cloth is first fastened to them. A space of $\frac{1}{16}''$ is usually sufficient to allow the lid to revolve 180°, but the actual figure is a matter of experiment, and depends on the thickness of card. Note that a satisfactory hinge cannot be made by using cloth on only one side of the card.

As the hinge itself takes up some room, it will be found desirable in actual practice to make both the lid and the side to which the hinge is fastened a little smaller than indicated in the drawing.

Hinge the lid immediately after scoring, and *before* fixing the sides of the box together.

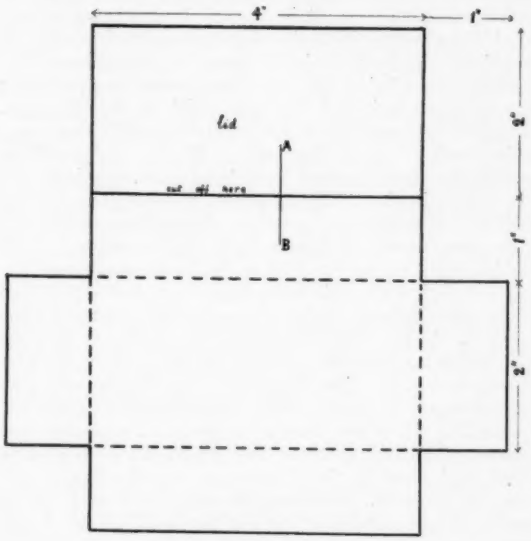
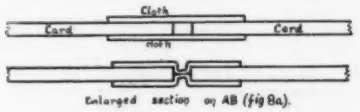


FIG. 8a.



FIGS. 8b, 8c.

FIG. 8d

NATIONAL ASSOCIATION OF MANUAL TRAINING TEACHERS (LONDON BRANCH).

A MEETING of the London branch of the Manual Training Teachers' Association was held at the College of Preceptors, Bloomsbury Square, on Saturday, November 20, when an interesting lecture was given by Percy Wells, Esq. (head of the Cabinetmaking Department, Shoreditch Technical Institute), on "Woodwork in History and Art." The chair was taken by Mr. S. Barter, Inspector of Manual Training under the London County Council.

The lecturer said that though it would be very interesting to outline the history and trace the development of woodwork in other countries—in Egypt and India in the East, and Italy in the West—the time at his disposal would not allow him to go so far afield, so he would confine himself to English work, and the influence of other countries on it. It was worth noting that the changes in style and character of woodwork could be clearly traced by means of examples which had been handed down, and which were stamped with the characteristics of the age which produced them. Many of these examples were more beautiful than anything which was made to-day. Nearly every village could show specimens of local handicraft, ranging from the screen in the village church to the handsome guildhalls of the eastern counties. Historians seemed to have overlooked all this work, for one searched in vain to find out the names of even the most notable craftsmen of their day. He was afraid that the old spirit of craftsmanship was dead—as dead as the apprenticeship system. If it were to be revived, it could only be done in connection with the schools and technical institutes of the country. The time was when in England culture was shown by the doing of something noble and beautiful. Children should be taken to museums and places of historic interest, and there shown the beautiful work done by the earnest and conscientious workmen of the past. It should be considered an essential part of their education to visit the local historic buildings, and study at first hand the noble productions of our craftsmen and architects. Boys and girls learnt in school about the works of Geoffrey Chaucer, the father of English poetry; but how many of them knew that the author of the *Canterbury Tales* was clerk of the works during the rebuilding of Westminster Hall? They should be taken to see those ancient buildings rich with historic association, and become as familiar with the names of the builders and most noted craftsmen connected with them as they were with the names of celebrated generals and statesmen. He would also have photographs of historical woodwork hung in all our manual training centres. Most boys never saw a piece of really good work. The study of these reproductions of works done by the master craftsmen would help them to reverence the great work done in the past.

The lecturer then proceeded to show a most valuable collection of lantern slides, illustrating nearly every phase and style of woodwork done in England, and showing how modern furniture had been gradually developed from rude and cumbrous beginnings. In the matter of chairs, for instance, numerous examples were shown, beginning with the time of Edward the First, when chairs were considered the luxury of kings, the ancient coronation chair now in Westminster Abbey being taken as an early historic example. Among later work was a Sedan chair of the eighteenth century, which showed very fine workmanship and elaborate carving. Examples of Chippendale furniture were also exhibited, the graceful curves contrasting strongly with the straight-backed and stiff-looking chairs of earlier periods.

Chippendale, remarked the lecturer, was the first craftsman to create furniture in his own name. He was also the first to publish a book on design in woodwork. Thomas Sheraton, some of whose work was thrown on the screen, was our greatest cabinetmaker. Up to the seventeenth century all furniture was made of oak. But in the reign of William and Mary this was changed. New foreign woods brought in new methods of workmanship. Marquetry and the use of veneer were introduced from Holland. It was interesting to note that originally the Dutch did not stain their wood, but relied on its natural colour. A good range of colour was obtained even when thus restricted. The French stained their work, and thus introduced a much more extended range of colour. It was Sheraton, however, who taught us how to use veneer in the right way. He came to London to make his fortune, but he didn't succeed in doing so. He was a most painstaking and conscientious workman, and was as much a hero in his own particular department as Nelson was in his. He practically starved himself to do fine work. He, the master craftsman of his age, had only one chair of his own to offer the casual visitor. Why should not boys know about such a noble worker as this, so that the true spirit of craftsmanship might permeate the whole school through the medium of the manual training centre? The story of the workshop could be taught side by side with the other branches of history. In visiting a school he once questioned the boys, and found that, though they all knew the names of our greatest soldiers and sailors, not one of them could tell him the name of our greatest carver, Gibbons, who was, moreover, a Londoner, and had his workshop in the fields at Deptford. It was Evelyn who discovered Gibbons, and introduced him to the notice and patronage of Charles the Second. A story runs that this celebrated craftsman carved a rose which was placed in the royal apartment, and that the king attempted to pluck it, so real did it seem. At any rate, whatever may be our opinion as to the naturalistic style of his work, there was no doubt that Gibbons was the master craftsman in his own branch of wood-carving.

In dealing with the history of domestic furniture, there were numerous examples still in existence which gave us a very clear idea of its gradual development. Take, for instance, the chest. The earliest examples he could show them was that known as a Crusader's chest, of about 1250. The earliest form of chest was a "dug-out"—that is, one cut out of a solid tree like an ancient "dug-out" boat. Another seventeenth-century example which he could show them was a "bridal chest." Here was the legend still visible, "This is Esther Hobson's chest." He thought that such a wedding present was far more useful than many that were given to-day. Notice the great advance in workmanship and its quaint decoration. Then there was Queen Elizabeth's chest, which showed the earliest

type of inlaying, and a cheese cupboard which developed later on into a "Yorkshire dresser." The press came next, and was the forerunner of the modern wardrobe. They might also trace the modern sofa and settee from the old-fashioned settle, a fine example of which they could see on the screen. They might particularly notice the characteristic "linen fold" carving, which originated in the use of a thin paper-like covering used for screens.

Glancing briefly at the history of ecclesiastical woodwork, they could see how much careful work was preserved in the choir stalls of our cathedrals, as witness the very fine fourteenth-century work in Ely Cathedral. The stalls were, as they saw, very finely carved. This, indeed, was a period when the master carver held equal rank with the university professor. Looking at the choir seats in Hereford Cathedral, they would notice the grotesque carving on them. The monk-craftsman would often satirise his fellow-monk by making caricatures of him, combined with queer birds and beasts. Here was one representing two bibulous monks attacking a beer barrel. These seats were all cut out of one solid piece of wood. The screens, however, must, in his opinion, hold a premier place in church woodwork. They were often done by local craftsmen who were deeply imbued with the religious spirit, and who put their very best work into them, realising that they were working "for the glory of God." Indeed, they sometimes left inscriptions avowing that this was their aim. One consequence of this was the unique individuality of the work. It was not some other person's design copied over and over again, but they put their own personality into the work, so that we never see any two exactly alike. It was unfortunate that at the Reformation many lovely screens were pulled down and the figures destroyed; nevertheless, a great number had been saved which amply testified to the excellent workmanship of these unknown craftsmen.

It would be well to remember the difficulties met with and overcome by these old workmen. There was no fret-cutting machine, no planing machine; everything had to be done by hand with indifferent tools, and one could not but admire the satisfactory result of their painstaking labour.

The Italian workmen who were brought into this country by Henry the Eighth introduced another type of work altogether. These foreign craftsmen were not under the influence of religious sentiment. The Gothic screens which were destroyed by the zealous reformers were replaced by others totally different in character, in which the sacred symbol of the Cross was replaced by the royal coat-of-arms; for it was obligatory to insert the lion and unicorn somewhere in the screen, to emphasise the newly-acquired supremacy of the king in matters relating to the Church.

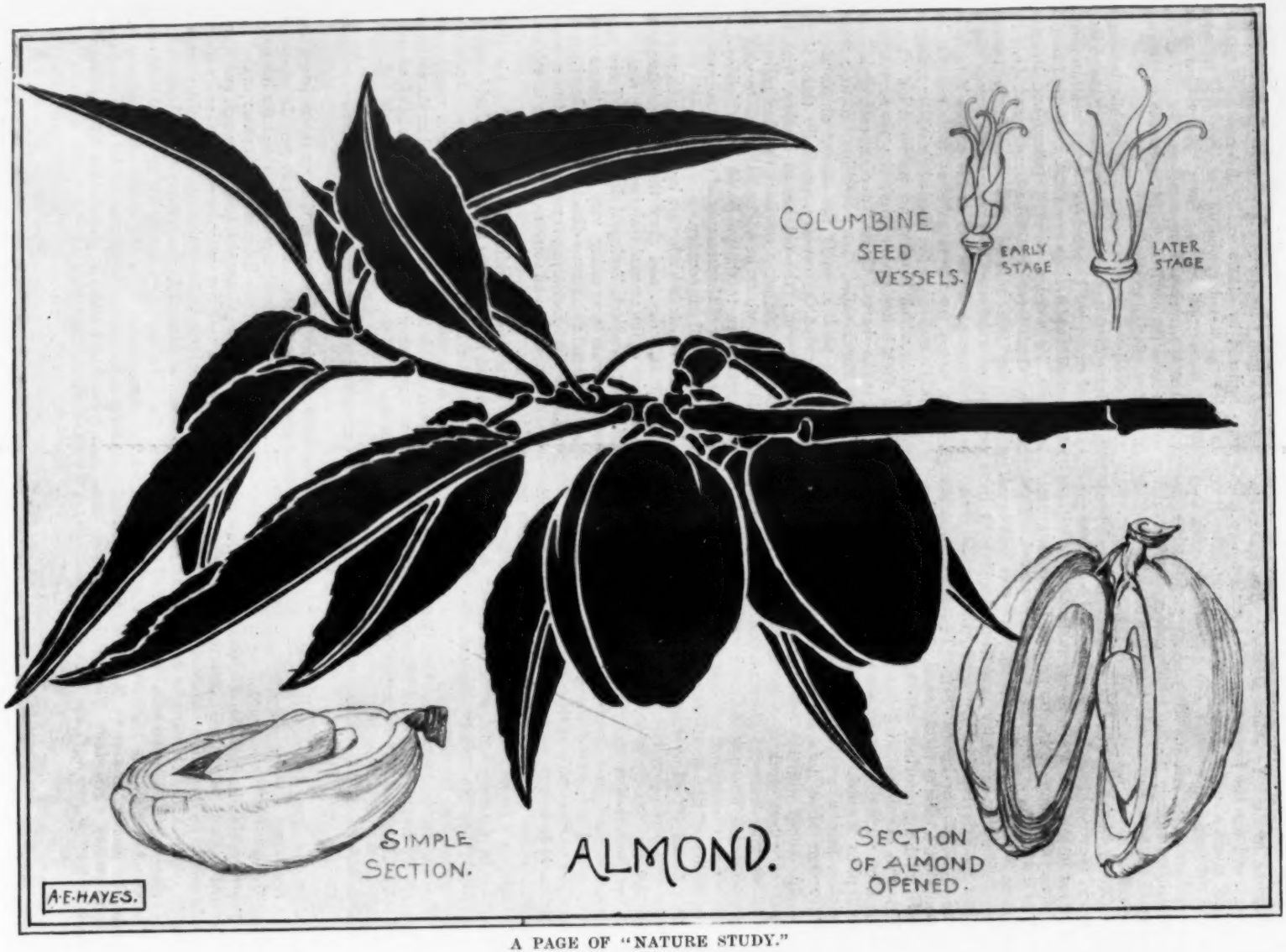
The woodwork in connection with public buildings and private dwellings would provide material for a long course of study, but he could only briefly refer to them, and show slides of various types of houses—the baronial hall, with its wooden minstrel gallery and massive benches, which served as tables by day and beds by night; the half-timbered guildhall of the eastern counties, of which that at Lavenham in Sussex was a beautiful example; the hall of the Middle Temple in London, noted for its magnificent roof, and for its oaken tables made from the wood of Sir Walter Raleigh's ship, and in which Shakespeare produced his play of *Twelfth Night* before Queen Elizabeth; the semi-ecclesiastical tithe barns, those "wooden cathedrals" as William Morris called them, recalling the time when tithes were paid in kind; the ancient almshouses in various parts of the country, especially those to be seen at Leicester; the old inn at Ludlow, with its picturesque overhanging stories; the fine gallery at Hatfield House, which he advised them all to visit (it was thrown open to the public on Bank Holidays),—these were a few of the triumphs of craftsmanship which were the pride of our country.

He would conclude his lecture by bringing them back to the present day, and show them a photograph of the interior of the manual training workshop connected with the Shoreditch Technical Institute. These lads they saw were now doing very well for themselves, most of them having gone direct from the Institute to prominent West End firms, some as draughtsmen, some as pattern-makers, and some as journeymen in cabinet-making firms.

Mr. Barter, in thanking the lecturer for his able address, said he had never seen a more valuable collection of slides dealing with the history of woodwork. It was a question whether craftsmanship would ever be again what it had been in the past, when the national life was written in wood and stone, instead of, as now, in books.

Nature and Ornament, vol. ii.: Ornament the finished Product of Design. By Lewis F. Day. (*Batsford, 94 High Holborn.*)

For upwards of a quarter of a century Mr. Day has devoted himself to writing books of great value and assistance to all art students and craftsmen. The earlier books, such as *The Anatomy of Pattern*, *The Planning of Ornament*, etc., have all been rewritten and enlarged. The present volume is the second of the two which take the place of *Nature in Ornament*, first published about twenty years ago. The original volume was excellent in every way; but with more space, and a greater wealth of illustration, the two recent issues are as near to perfection as books can go. In studying Mr. Day's works one always seems to feel the intensely practical nature of the information given, expressed in such straightforward, unmistakable language, and illustrated by such excellent examples of ancient and modern art. The volume under notice deals with the use and expression of natural forms in every type of ornament, and the influence which nature has upon ornament and which material has upon the nature of the ornament. It is a perfect mine as far as ornamental details go, and is a book that cannot be passed over by any one interested in artistic crafts.



A PAGE OF "NATURE STUDY."

The Editor's Bookshelf.

MORE GIFT BOOKS.

The Boy's Own Annual. (*Religious Tract Society*).

As of old, the *Boy's Own Paper* lives up to its motto—*Quicquid agunt pueri nostri farrago libelli*—and the bound volume for the past year will prove a welcome gift. Stories, long and short, poems (funny by preference), hobbies, dogs, games, birds, animals, soldiers, sailors, jokes, and pictures all go to make up a collection which will delight the heart of any healthy-minded schoolboy.

Ford of H.M.S. "Vigilant." By T. T. Jeans. (*Blackie and Son.*)

Time was when writers were content to flavour their sea-stories with a few nautical expressions, leaving the correctness of the same entirely on the knees of the gods; but *nous avons changé tous cela*, and nowadays writers of nautical yarns are expected to have a fairly intimate acquaintance with their subject. In this respect few writers are better equipped than Staff-Surgeon Jeans; and we hardly need to be told that the characters are taken from life, and that all the vessels described are actual ships with altered names—for both are drawn with a firmness of touch that can only come from actual acquaintance. It must not be imagined, however, that the book relies for its interest entirely on the technical knowledge of the writer, for the story alone would easily place it in the front rank. As soon as Midshipman Ford joins his ship, he is engaged in a hunt for Chinese pirates who have captured the yacht of an American millionaire. This, of course, leads to several very exciting situations, but nowhere does the writer exceed the bounds of probability. We should strongly advise every one to look out for *Ford of H.M.S. "Vigilant."*

The School across the Road. By Desmond Coke. (*Henry Frowde and Hodder and Stoughton.*)

It must be extremely difficult to discover a fresh plot for a school story, but Mr. Coke does not fail us. Imagine, if you please, two schools, with only a narrow lane between them, and with a hereditary feud. Next, an unfortunate sham fight, which the smaller school wins after military tactics have developed into fisticuffs, thus intensifying the feud. Lastly, the smaller school (run on athletic lines) is amalgamated with the larger, which apes the manner and the classical distinction of a great public school. The boys from the smaller establishment have a rough passage, and the hopeless want of tact of the "Head" leads to much trouble. Mr. Coke shows how character improves in time of tribulation, and finally unites the two parties in a chapter which no schoolboy must miss, for a snowball fight is not lightly to be despised. While praising the book heartily otherwise, one may wish that Mr. Coke's characters would modify their language a little. "Devil" and "swine" are both in the dictionary: let them stay there.

With Kit Carson in the Rockies. By Everett M'Neil. With five illustrations by D. C. Hutchison. (*W. and R. Chambers.*)

It is not easy to realise the development that has taken place west of the Rockies during the last seven or eight decades, and, as the author observes, the United States owes a great deal to those early pioneers who, obedient to "the call of the wild," not only found their way to the hunting grounds of the west, but through the west to the Pacific Ocean. From this point of view, Mr. M'Neil sets out to describe trapper life and adventure in a way likely to make any decent boy's mouth water. Kit Carson is "just splendid."

FROM "A HERO OF SEDAN." (Blackie and Son.)

Bravo, Bob! By Andrew Home. With six illustrations by Harold Copping. (*W. and R. Chambers.*)

The doings of Martin Allingham and Bob Kitchin (the boy from Canada), and all the other fellows at school, are told in an amusing fashion. Unluckily,

Martin and Bob become estranged when the latter is made a prefect; but an interesting finish is given to the story by the healing of the breach, and the explanation of the mystery surrounding Martin's father.

The Conquest of Claudia. Audrey's Awakening. By E. L. Haverfield. (*Henry Frowde and Hodder and Stoughton.*)

In both these books the writer attains considerable success in the working out of the plot and in the construction. The momentary doubt we felt as to whether Claudia was a character worth conquest, or Audrey a personality worth awakening, passed as the stories developed. There is a certain mischievous tradition, which dies hard, of the mid-Victorian attitude of girls towards their hapless, and generally incompetent, governesses; but it is not a serious blemish in the presentation of Claudia's home life. The heroine's rather gloomy ambition and the pursuits of the new governess, with its suggestion of Russian "anarchy," and her connection with Miss Saunders, the ideal story-writer who "understands girls," will make *The Conquest of Claudia* especially interesting to young readers with literary interests.

From "The Wonder Book." (Ward, Lock, and Co., Ltd.)

In the process of *Audrey's Awakening* there is a pleasant piece of mystification concerning a schoolmate towards whom she is particularly antipathetic, and the relation should stand as a warning to elders who seek to arrange things for self-contained young people of sixteen. We could wish that the author's real insight and skill in dialogue had led her to scorn the very stale slang expressions which her characters occasionally use. The books are excellently printed, well illustrated, and most attractively got up.

The Quest of the Blue Rose. By Winifred N. Letts. **Mistress Nancibel.** By Elsie Jeannette Oxenham. (*Henry Frowde and Hodder and Stoughton.*)

The Quest of the Blue Rose is a cheerful and high-spirited story concerning the life of a young girl clerk in the post office at Norchester, who, after office hours, is one of the courageous residents of the Grey House in Suffolk Square, a hostel founded by a benevolent society. A quite unusual spirit of healthy enjoyment and taste for literature pervades the atmosphere of the book. The *blasé* weariness of some of our privileged youth is implicitly rebuked by the wholesome energy and laudable ambitions of Sylvia and her companions.

Mistress Nancibel goes further afield, and gives the story of a girl of the time of the Restoration. She accompanies her father in his exile, and shows her mettle in the strange conditions of the life and the culminating horrors of the plague. The old ballad from which the heroine's name is taken is skilfully interwoven with the narrative of her subjugation of the "nightmare," and his revealing as a brave gentleman of a discourteous squire. The books are most effectively illustrated and presented.

Locomotives of the World. By the Rev. J. L. Howden, B.D. (*Henry Frowde and Hodder and Stoughton.*)

To the boy with a mechanical turn of mind this fascinating book, with its beautifully coloured pictures of the famous locomotives of the world, will prove a cherished possession. The Rev. J. L. Howden is a parson with a passion for railways, and when he holds forth on his pet subject there are certain to be no "sleepers" in his juvenile congregation. The book is handsomely produced, and the printers are to be congratulated on the three-colour plates, which form a distinct feature of the volume.

The Gem Series. (*Macmillan and Co.*)

Here we have a series of seven dainty booklets, such as are now used as substitutes for Christmas cards, bound in "peltine" leather, with decorated titles and small illustrations of repute. The titles are Irving's "Christmas," Miss Mitford's "Country Pictures," Thomas Hood's "Poems," Christina Rossetti's "Goblin Market," Tennyson's "In Memoriam," Fitzgerald's "Omar," and F. W. H. Myer's poem "Saint Paul."

The Happy Book. (*Henry Frowde and Hodder and Stoughton.*)

If you know a dainty little maiden of about seven, who washes her hands before she takes down her books, buy for her *The Happy Book*, which contains delicate Dresden-like pictures by Millicent Sowerby, and verses to match by Githa Sowerby. You will delight her

little heart—bless her!—and train her in "artistic appreciation," so long as you do not name these long words.

The Girls' Own Annual. (*Religious Tract Society.*)

The *Girl's Own Paper*, bound up to form the yearly volume, forms one of the best possible presents for "a simple maiden in her flower." It is interesting to note the marked difference in the character of the contents of this paper as compared with twenty years ago. The magazine has been modernised completely, and the girl's realm is mirrored in its pages in a fascinating manner. A special word of praise is due to those responsible for the art editing. It is a pleasure to turn lazily over the pages merely to look at the pictures.

Tuck's Picture Puzzle Postcards. (*Raphael Tuck and Sons.*)

Here is a hint worth its weight in gold for the coming season. If any hostess is worried about the coming festive gathering, and tired of inviting people to "play something," let her purchase a few packets of Messrs. Tuck's new publication, and leave her guests alone—the postcards will do the rest. There are twenty-seven sets of cards, each containing twelve or more designs, boxed in sets of six postcards, all different. As substitutes for the stereotyped Christmas card the puzzle postcards are also to be recommended. We have tried one of the cards on a spirited and somewhat restless youngster to our own comfort. This is a valuable hint for holiday time.

Bo-Peep. (*Cassell and Co., Ltd.*)

As we write, this annual is being enjoyed by a small victim of bronchitis, and as an incentive to convalescence the book can be confidently recommended. It is full of pictures of the right kind, and packed with short stories which will tempt young pupils to "reading without tears."

Happy Hearts. (*Ward, Lock, and Co.*)

This picture book for the little ones is now in its third year of issue, and has evidently come to stay. We are not surprised, for it contains pictures on almost every page, and the reading matter is of the simplest possible character.

Peeps at Many Lands. (*A. and C. Black.*)

We have received two volumes of this series, dealing respectively with China and New Zealand, and intended for boys and girls in their early teens. Each volume contains twelve full-page illustrations in colour of the high-class style we now expect from Messrs. Black. The letterpress is interesting, and in no degree suggests the geographical text-book. A strong feature is made of the work and play of the children in each land under description, and the story of the country is treated from a humanistic point of view. We can cordially recommend the series, which now contains twenty-eight titles.

N.B.—The charming line illustration given on p. 324 of our last issue is from Mr. Andrew Lang's *The Red Book of Heroes*, which was reviewed in our November issue. On p. 326 of the same issue the books referred to as "The Andrew Lang Fairy Series" are the new volumes of Messrs. Longmans' excellent series of Prize Books, priced at 2s. or 2s. 6d.

NEW EDUCATIONAL WORKS.

Mères et Fils: par F. Gache, professeur au Lycée de Montpellier, Lauréat de l'Institut; Preface de Madame Pauline Kergomard, Inspectrice générale de l'Instruction publique. (*Bibliothèque des Parents et des Maîtres.*) *Edouard Privat, Toulouse; Henri Didier, Paris.*

The present volume of this useful library will not appeal so directly to the English teacher as some of its predecessors. At the same time, it is one which will amply repay perusal by all who are interested in educational problems. The standpoint of the writer—that education is not merely a question for the school, but equally for the family and the community—is one which is apt to be ignored. The special question with which he deals is the *internat*, the half-monastic, half-military, and wholly unsatisfactory system of boys' boarding schools in France. The reforms for which he pleads, and in which he sees the possibility of a real and valuable education by means of the *internat*, will appeal to many in this country as well as in his own. The part of the home and the mother in these reforms is specially well expressed. The style of the writer can be recommended as entirely free from the dullness with which a writer on our side of the Channel would have felt himself obliged to treat such a subject.

Pour la Vie Familiale: Conférences faites a l'Ecole des Mères. (*Bibliothèque des Parents et des Maîtres.*) *Edouard Privat, Toulouse; Henri Didier, Paris.*

To Bordeaux belongs the credit of founding the "Mothers' School," under the direction of Madame Augusta Moll-Weiss, with all its various courses in theory and practice, designed for pupils ranging from the senior classes in girls' schools to the adult who is facing the practical duty of founding a home of her own. The syllabus of work for the year, as given in the introductory part of this book, is admirably full and practical. Mothers trained in such a school ought to be immune to many of the errors which are deplored by the medical men and social workers of the present day. In addition to the more formal work, popular lectures are given from time to time on subjects connected with the work and the aims of the school, and the present volume is a reprint of a dozen of those lectures. The list of contributors embraces, in addition to that of the founder of the school, such well-known names as Emile Boutroux, Gabriel Compayre, Frédéric Passy, and Charles Wagner. The contributions are all worthy of being presented in this form to the wide circle to which they will now appeal; a circle which includes all those who are interested in the problems of the practical education of girls for what is their highest and most important vocation—problems no less pressing in England than they are in France. At the present moment there is special significance in such a paper, for example, as that by Charles Wagner on "The Poetry of Humble Duties."

Principles and Methods of Physical Education and Hygiene. By W. P. Welpton, B.Sc., Master of Method in the University of Leeds. (W. B. Clive, University Tutorial Press, London).—The author is better than his word. In addition to what is specified in the title, the book contains a singularly interesting summary of the history of physical education, contributed by Professor J. Welton, M.A., of the University of Leeds. This in-

troductory chapter is a concise and clear exposition, bringing together in one comprehensive view the physical aims of the various systems of education in the past—among primitive races, in ancient Persia, in the Greece of Homer, in Athens and Sparta, in early and imperial Rome, in mediæval Europe, in the age of chivalry, in the schools of the Renaissance, and in the seventeenth, eighteenth, and nineteenth centuries. From one point of view at least—namely, that of the neglect of the physical and the unwise predominance of the intellectual in the educational schemes of more recent times—this introduction serves admirably to point the moral of all that follows in the book, and emphasises the one-sidedness of our modern education as compared with that of ancient times.

In the treatment of the main subject—the principles and methods of physical education—rather more stress seems to be laid upon the former than upon the latter; and wisely so, as there seems to be a danger of physical education becoming too much a matter of working through certain systems or syllabuses of exercises, official and otherwise. The standpoint of the writer is an admirable one, and his conception of what physical education really means can be best expressed in his own words: "The aim of physical education is thus seen to be a very complex one, and to be more intimately bound up with intellectual and moral training than appears on the surface. Its end, so far as the body alone is concerned, is health, strength, and skill; but it seeks also to draw out, foster, and develop those qualities of intelligence and character that are required for effective and successful co-operative and competitive practical action. . . . The pursuits and occupations of the physical aspect of school life must be tested by this criterion. Exercises that merely develop health and strength, though good in themselves, cannot fully attain the desired end. They must, if it is found advisable to include them, be subsidiary to pursuits and occupations demanding intelligence and spirit. Modelling, carving, and handicrafts are good, since in them skill and intelligence are exercised in relation to æsthetic and practical ends. Co-operative games and contests should be included, for they train not only health and strength but character. It is to a judicious combination of physical exercises, manual crafts, contests, and games that the problem of physical education must look for its fullest and truest solution." A considerable space is devoted to the physiological facts required to be known by the teacher. The physical basis of life, the nervous system and its education, and the organic life of the body are carefully considered; the highly important problems of fatigue and of exercise and growth are also discussed in their scientific and their practical aspects. Chapters follow on the subjects of cleanliness and fresh air, and on bodily attitudes, the care of the eye, and the study and treatment of abnormalities. The whole forms an admirably clear and practical work on an aspect of education which is now beginning to assume its proper place in our educational theory, and at least to some degree in our school practice.

Exercises in Algebra. By R. Nettle, M.A., and H. G. W. Hughes-Games, M.A. (Longmans, Green, and Co.)

The authors of this useful collection of examples are mathematical masters at Osborne. The book is an excellent one of its kind, and covers the usual ground to the end of geometrical progressions; it does more than this, for the authors have succeeded in keeping in mind both the intrinsic difficulties of the mathematical side of the work and the necessity in these days of enforcing its practical application. The examples on the use of symbols are varied, suggestive, and plentiful, and should help the pupil to use his knowledge of algebra in the laboratory.

The importance of teaching not merely the rules but their wider application is too often forgotten in the mathematical classroom, and the complaint made by science masters that boys who can solve quite difficult "x" equations fail to manipulate simple formulæ is not without some justification.

We note a simple point, but suggestive. At the commencement of simple factors exercises are given, "Put into factors with the negative sign in front." This anticipates the pupil's difficulty in recognising $(a - b) = -(b - a)$. Problems on simple equations are followed by applications to geometry. The questions on graphical work are more varied than is usual, and evidently prepared with a keen eye to practical work later. Some are interesting as novelties—for example, "Draw a coast line by aid of points whose co-ordinates have been noted."

In Variation formulæ of all descriptions are utilised, a noteworthy section. The book concludes with 101 sets of miscellaneous examples.

We can thoroughly recommend this collection to schoolmasters, especially to those who find other people's "book work" annoying and unnecessary.

Cassells' Elementary Geometry. By W. A. Knight, M.A., B.Sc.

This useful little text-book follows the plan—(1) definitions, (2) experimental course, (3) theoretical course.

We should prefer the two latter side by side; teachers find great difficulty in persuading pupils not to be satisfied with the experimental. This difficulty is most prominent when the rider stage begins; most pupils will spend long enough over drawing the figure to do the proposition, and the lazy element persistently prove (?) the rider experimentally.

The propositions are well grouped, and such difficulties as "area" are thoroughly explained. The text covers Euclid I.–IV., and a goodly number of exercises occur throughout. The pages would have looked more attractive if the type had been a little more varied; headings such as "Theorem II." need intensifying, and we note this is done in the case of alternative proofs. The book is well worth the consideration of schoolmasters.

Elementary Algebra. By P. Ross, M.A., B.Sc. (Longmans, Green, and Co.)

I wonder whether the last word has been written about elementary algebra; all text-books are so monotonously alike, even in such minor details as illustrative examples, that one might justly think so.

The syllabus, like a restaurant *menu*, is apparently fixed, and all one has to do is to criticise the cooking. Even if the cooking is good, one may be allowed to ask why mutton chops must always be accompanied by tomato sauce and sole by a slice of lemon. Every reviewer of a new algebra probably turns at once to the chapters on indices and logarithms; he finds the same list of powers of 10, etc., sighs, and turns elsewhere for something good to say.

The present book is quite as good as most text-books; it is written specially for the "private study" reader, and claims to follow the recommendations of the Mathematical Association.

In his preface the author writes: "The solution of equations is not treated as the outcome of arbitrary rules, but each step is shown to follow logically from the fundamental axioms." But after one page of work we find in black type: "Any term may be transferred from one side of an equation to the other by changing its sign," and on the next page five rules for solving equations. This is a mistake; the idea in the preface is the ideal. Again: "The graphical solution of simultaneous equations always precedes their algebraical solution." This may be wise or otherwise, but only one, the simplest, type of simultaneous equation is thus graphically treated.

We can only note one or two other points: we see no good whatever in classifying quadratic equations as "pure" and "adfected." In the chapter on indices the author quite correctly *assumes* as the fundamental law $a^m + a^n = a^{m+n}$ for all values of m and n; he then finds meanings for a^0, a^{-n}, $a^{\frac{m}{n}}$. Assuming these meanings, he proceeds to prove the fundamental law, surely an elegant instance of *argumentum in circulo*. In chap. xliv. approximation and the turning values of functions are fully dealt with; other headings are "Convergency" and "The Exponential Theorem."

On the whole we commend the book as a serviceable text-book of a satisfying, non-revolutionary character, void of fads and attempts at originality which confuse the issue in a vain attempt to win a reputation for cleverness at the expense of clearness.

MODERN SCIENCE NOTES.

BY J. G. M'INTOSH, B.SC., SECONDARY SCHOOL, GATESHEAD.

"APPRENTICESHIP."

THE writer of the editorial in *Engineering* for November 12 runs "amok" on the scheme of the London County Council regarding the training of apprentices. After a thinly disguised sneer at the primary school teacher and his technical school colleague, the writer complains that the little information derived from employers of labour is ignored entirely by the committee.

I am not fully aware of the steps taken by the London County Council Committee to ascertain the views of employers of labour on the matter, although I imagine that these would be consulted.

The curious thing is the manifest reluctance of the British employer of labour to interest himself in the technical education of the apprentice.

The writer eulogises the excellent system of training apprentices inaugurated on the north-east coast six years ago. This system was largely due to the despised "pedagogue," and it was only begun after long and continued efforts by the best representatives of the teaching profession upon employers of labour.

Even yet it is difficult to secure the presence of employers at round-table conferences. The fact of the matter is that many of them so exploit cheap apprentice labour that they view with dismay any scheme which will mean the attendance of the apprentice at day classes.

The writer gives his whole case away when he instances the fact that several firms have made further arrangements by which their most capable apprentices are allowed to delay starting until 9 a.m., with a view to enabling them to take up a further number of classes. Further, in the very district which he eulogises, the employers who are most advanced are adopting the half-time system, and sending their apprentices during certain afternoons to technical classes. We know of one firm who for some time past has arranged special classrooms at their own works and engaged expert "pedagogues."

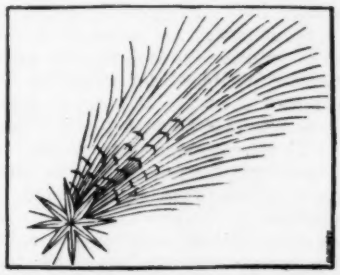
The raising of the school age to fifteen is looked upon by the writer as a wasted year. The old arguments about the adaptability of the youth to manual dexterity at an early age, etc., are produced. We have heard them all before. The effect of long hours upon the physical constitution of the child, the serious reports of the Committee on Physical Deterioration—all these are ignored.

At present 70 per cent. of the time spent at evening classes by the apprentices of this country is wasted. They come physically fagged from a long day in the factory commencing at 6 a.m. and finishing at 5 p.m. They have little or no time to do adequate study at home, and as a result we have an appalling waste of public money and individual effort.

We recommend to the study of the writer in *Engineering* the efforts of German employers of labour on behalf of their apprentices. One hears a great deal nowadays of the vast strides Germany is making in the engineering world. We are of the opinion that much of that progress lies in the training which their youths obtain. *Engineering* could not do better than take a leaf from their book.

HALLEY'S COMET.

The November number of the *Observatory* gives some further particulars of the course of the comet. It is steadily increasing in brightness, and a ten minutes' exposure with the Greenwich 30-inch reflector gives a strong image. An ephemeris for April and May 1910 is also given. From this we see that the nearest approach to the earth should occur on May 20, the distance then being estimated at 14·3 million miles. The



HALLEY'S COMET, 684. (From the *Nuremberg Chronicle.*)

revised elements indicate that it should transit the sun's disc on May 18, but this transit will, of course, be invisible in Europe. It appears possible that at that time the tail of the comet may extend beyond the earth, and be visible in the midnight sky.

Mr. A. D. Crommelin gave an address to the British Astronomical Society last week. He explained in a simple way why the period of the comet is shorter this time than ever before. In 1835, on its return journey, it appears to have travelled rather nearer to Jupiter,

HALLEY'S COMET, 1066. (From the Bayeux Tapestry.)

and the law of gravity affecting its orbit decreased its speed, with the result that its aphelion point is nearer to the sun than on any previous occasion. He gave a rough ephemeris. In January it may be visible with good glasses, say Goerz 9X binoculars, as an early morning star. In February and March it will be entirely invisible owing to its nearness to the sun. In April its magnitude will rapidly increase, and in May he predicted "a good show."

Messrs. Crommelin and Cowell have been awarded the "Astronomischen Gesellschaft" prize.

By the courtesy of the publishers we reproduce two prints taken from Chambers's *Handbook of Astronomy*.

"THE STORY OF THE COMETS." *

An appropriate book just published is *The Story of*

* *The Story of the Comets.* By G. F. Chambers, F.R.A.S. Oxford: Clarendon Press. 6s. net.

the Comets, by G. F. Chambers. It is modelled on the author's chapters in his *Handbook of Astronomy*. Mr. Chambers's book is lucid in style and eminently readable. We quote the following extracts:—

"The physical difference between different comets is a matter very little appreciated or understood by people in general. With such, every thought is concentrated on the comet's tail, if it has one; or if it has not a tail, then the verdict is 'No comet.' Yet the facts of the case are that the comets with tails are, and always have been, considerably outnumbered by the comets without tails. An explanation of the popular view is to be found in the fact that the tailed comets are very frequently visible to the naked eye, whilst the tailless comets may be said to be never so visible."

"What is the colour of a comet? Have comets ever any colour? From my own observations, extending over many years (and I suppose I have telescopically examined more comets than most people), I should not have hesitated to answer these questions in the negative, and have said that all comets exhibit more or less a silvery-gray hue. On the other hand, however, there is a considerable amount of evidence available which conflicts with this statement. Passing over what I cannot but consider the sensational assertions of many ancient and mediæval writers of comets appearing of the colour of blood, or fiery red, and so on, we do find in the writings of modern astronomers sufficient to show that such tinges as 'yellowish' or 'yellow' or 'ruddy' are not unprecedented, both as regards nuclei and tails. The comet of 1769, the great comet of 1811, the great comet of 1843, Donati's comet of 1858, Coggia's comet of 1874, and Fabry's comet of 1886 are cases in point. To this it must be added that in a few rare cases mention is made of 'bluish-green' as a tinge which has been noticed. After all is said and done, however, I find that in looking into the published accounts of many comets by many observers of the world, there is a decided preponderance of testimony in favour of 'white' or 'silvery-gray' as being the ordinary hue of most comets."

On the question of the constitution of comets, Mr. Chambers says: "I give, under great reserve, the answer that probably the heads are a mixture of solid and gaseous matter, and that the tails are gaseous, the gaseous matter in the tails being the result of the volatilisation of the more solid matter."

On the nature of the influence which causes the tail of the comet, Mr. Chambers follows the lead of other well-known physicists in attributing it to electrical cause.

Another appropriate publication is *Astronomy for Amateurs*, by Camille Flammarion, translated by Frances A. Welby, which has just been added to Messrs. Nelson's useful "Shilling Library." This volume contains a fascinating chapter on comets in general, and makes interesting reference to that of Halley.

"The great Newton announced that, like the planets, comets were obedient to universal attraction; that they must follow an extremely elongated curve, and return periodically to the focus of the ellipse. From the basis of these data Halley calculated the progress of the comet of 1682, and ascertained that its motions presented such similarity with the apparitions of 1531 and 1607 that he believed himself justified in identifying them and in announcing its return about the year 1759. Faithful to the call made upon it, irresistibly attracted by the orb of day, the comet, at first pale, then ardent and incandescent, returned at the date assigned to it by calculation, three years after the death of the illustrious astronomer. Shining upon his grave, it bore witness to the might of human thought, able to snatch the profoundest secrets from the heavens!"

The Position of the South Magnetic Pole.

The publication of Sir Ernest Shackleton's book containing the account of the journey to the South Magnetic Pole, made by Professor David and Mr. Mawson, adds another and a fairly trustworthy determination of the Pole's position to those which have already been obtained. The position assigned to the South Magnetic Pole by Mr. Mawson on January 16, 1909, was—south latitude, 72° 25′; east longitude, 155° 16′. The greatest dip recorded appears to have been 89° 48′, and some disappointment was experienced by the failure to measure the exact verticality of the needle. After all, the exploring party seems to have attached somewhat undue importance to this, for regular diurnal change and magnetic storms would cause slight variations in the dip over the same area in successive periods of time.

The results of various observations made at different times are given below:—

Explorer.	Approximate Date.	Latitude of Pole.	Longitude of Pole.
		S.	E.
Ross.....	1841	73° 35′	147° 19′
Bernacchi....	1900	72° 40′	152° 30′
Scott.....	1903	72° 51′	156° 25′
Shackleton...	1909	72° 25′	155° 16′

The variation is more considerable in longitude than in latitude, but it must be remembered that a degree of longitude is in this case reduced to about twenty miles.

The position of the North Magnetic Pole is not better determined, and is not, of course, diametrically opposite the South Pole. The best determinations place it near 70° N. and 97° W. of Greenwich, while the indications of a secondary magnetic pole within the Siberian oval still further emphasise the want of symmetry of the magnetic conditions of the earth with its axis of rotation.

The recent controversy between Dr. Cook and Commander Peary has caused many people to ask how an explorer can furnish satisfactory evidence that he has actually been to the North Pole.

The Savilian Professor of Astronomy at Oxford (Dr. Turner) has suggested that a series of contiguous photographs of the horizon, or of an irregularly constructed snow wall built up all round the camera at a short distance from it, might be made, in such a way as to have a considerable and recognisable overlap in the successive plates. Then, if the sun be photographed on at least three of these plates, showing three equal altitudes, the series must have been taken at the Pole.

Another astronomer suggests that a star near the Equator might be selected, which by refraction would appear just above the horizon. If this star remained the same distance above the horizon all through the twenty-four hours a sufficient proof would be furnished. The drawback to this method lies, of course, in the fact that the polar journey would have to take place during the long polar night.

A further proposition is that a pendulum be erected free to swing in any plane. Such a pendulum would describe a circle round its point of suspension in exactly twenty-four sidereal hours. The drawback to this proposition is that it would require accurate mechanism and a good chronometer, for at a degree from the Pole the time of a complete rotation would only exceed that at the Pole by thirteen seconds.

NOTES AND SUGGESTIONS ON THE TEACHING OF EXPERIMENTAL SCIENCE, MATHEMATICS, AND DRAWING.

BY C. HAMILTON.

(*Continued from page 337.*)

Section XXII. (Continued).

TO return to the curve. Its meaning may be made clear by setting the students to find from it the volumes corresponding to given pressures, and *vice versâ*.

This is a suitable point at which to deal with variation. Recall the equation for the ratio of the circumference of a circle to the diameter — $\frac{c}{d} = \pi$. In this case, if c is halved or doubled, d is halved or doubled; if c is $\div 3$ or $\times 3$, d is $\div 3$ or $\times 3$; and so on, since π has always the same value. c is said to vary directly as d, and this is expressed by writing $c \propto d$. It follows from the example given that $c = \pi d$.

Now, whenever any quantity x varies directly as another quantity y, $\frac{x}{y}$ is equal to some constant (say k), and we may therefore write $x = ky$.

Again: consider the case of a rectangle. The area will increase directly as the length when the breadth remains the same, or $A \propto L$ and $A = BL$, where B is constant. When the length remains constant, the area varies directly as the breadth. We may say therefore that $A \propto B$ when L is constant, and $A = LB$. Hence, when both length and breadth vary, $A = LB$.

Triangles on the same base, or between the same parallels, may be similarly treated, and another case is found in the area of a circle. Since $A = \pi r^2$, and π is always constant, $A \propto r^2$. These examples should be compared with the equation for the elasticity of a gas. If k is the constant, $PV = k$ and $P = \frac{k}{V}$ Hence $P \propto \frac{1}{V}$. This is an example of inverse variation. That is to say, if P is halved or doubled, V is doubled or halved, and *vice versâ*.

It will be advisable to consider each of these formulæ in connection with the curve, which can be plotted by giving one variable the value 1, 2, 3, 4, 5, etc., and finding the corresponding values of the other variable. It will be clear from this comparison that the curve corresponding to two variables in the first degree, whose quotient is constant, is a straight line. This is direct variation. When the product of two variables is constant the case is one of inverse variation, and the curve is not a straight line. Finally, when one of the variables is not in the first degree (area of a circle), the curve is again not straight.

It may further be shown that a ratio such as $\frac{3}{4}$ represents the position of a point which may be described as the point (3, 4). Similarly, if the ratio $\frac{a}{b}$ is constant, the ratio represents a series of points (a, b) on a straight line.

If there is any difficulty, a few more curves should be plotted by the students.

EXAMPLES.

1. If the atmospheric pressure is 15 lbs. per square inch, what is this per square foot and per square yard ?

2. See Example 1. What would be the pressure in kilograms and in gms. per square centimetre ?

3. What is the weight of a column of mercury 760 mm. high and 1 square cm. sectional area, if mercury weighs 13·6 gm. per cubic cm. ?

4. What would be the height of a water barometer corresponding to 760 mm. of mercury ?

5. What would be the height of a glycerine barometer corresponding to 76 cm. of mercury ? The specific gravity of glycerine is 1·3.

6. What is the difference of pressure in gms. per sq. cm., and in lbs. per square inch, for a variation in the height of the barometer of 1 mm ?

7. A straight barometer tube leans against a wall in such a way that its lower end makes an angle of 60° with the floor. What will be the vertical height of the mercury column, and what will be its actual length, if the atmospheric pressure is normal ?

8. What is the pressure per square cm. at a point 20 cm. below the surface of water when there is a layer of petroleum 10 cm. thick floating on the top ? The barometric stands at 76 cm.

9. Find the pressure per square inch at a depth of 100 yards in the ocean. Specific gravity of sea-water, 1·027.

10. What is the pressure per square cm. at a depth d in a liquid of specific gravity s ?

11. If now, in Example 10, another liquid of specific gravity s_1 is poured on the top of the first to a depth d_1, what is the new pressure, and what is the whole pressure per square cm. ?

12. Why is mercury used in making a barometer ?

13. The piston of a lift pump is 6″ diameter and the stroke 12″. What volume of water will be pumped per stroke ?

14. If the pump in Example 13 makes 120 single strokes per minute, how many gallons of water will it pump per hour ? If this water is raised from a height of 20′, how many foot-pounds of work will be done per minute ?

15. If, in Example 14, 30 per cent. of the power given to the pump is used in working it, and the rest in lifting the water, what horse-power is required to drive the pump ?

16. A pump has a piston 1″ diameter, to which is applied a force of 100 lbs. The water passes to a vessel with a cylinder 10″ diameter. What will be the pressure per square inch, and the total pressure on the piston in the 10″ cylinder ?

17. Water at 750 lbs. per square inch acts on a piston 1 square foot in area. What is the work done per cubic foot and per gallon ? If the cost of the high-pressure water is 1s. 6d. per thousand cubic feet, how much work is given for a penny, and how much does one horse-power cost ?

18. It is required to pump water from a well 56′ deep. Could you have a lift pump at the surface ? and if not, where would you place it ?

19. Consider the atmospheric pressure to be H cm., the height of the short column of a syphon above the surface of the water to be h_1 cm., and the height of the long column to be h_2 cm. What is the pressure at the top of the short column ? What is the pressure at the top of the long column ? What is the difference of pressure in the bend ? Give a formula for the force tending to drive the water round the bend.

20. Will a syphon work in a vacuum ? Give reasons.

21. The volume of a gas is 300 c.c. when the barometer stands at 76 cm. What will be its volume when the barometer stands at 72 cm. ?

22. In many coal mines gas issues from the cracks in the coal. Would you expect to find more gas when the barometer was low than when it was high ?

23. The gas which issues from coal is lighter than air. In what part of the workings would you expect to find it in greatest quantity ?

24. The roofs of colliery roadways are frequently uneven and contain large holes. The shaft is filled with air. Describe what you would expect to happen in the roadways and in the shaft when the barometer falls. Is the work more dangerous with a low or high barometer ?

25. When the barometer stands at 30″, the volume of a gas measures 750 c.c. What will be the pressure when the volume measures 820 c.c. ?

26. A gas is enclosed in a cylinder. When the piston is 1½′ from the other end the pressure is 60 lbs. per square inch. What is the pressure when the piston is 6″, 12″, and 24″ from that end ?

27. A vessel A containing air at atmospheric pressure is connected by a tap with another vessel B, of the same size, which has been exhausted. What is the pressure in the two vessels after the tap has been opened and closed ? If B is now taken away, exhausted, connected again, and the tap opened and closed, what is the new pressure ? What will be the pressure if this operation is repeated a third time ?

28. Examine an air-pump. Suppose the volume of the receiver and its connecting pipe is 5 litres and the volume of the pump barrel is 1 litre. What will be the pressure of the air in the receiver after 1, 2, and 3 strokes of the pump?

29. The density of air under normal atmospheric pressure is 1·293 gms. per litre. What is this per c.c.?

30. What is the density of the air in each case in Examples 27 and 28?

31. A vessel containing air at a pressure of 4 atmospheres is connected to another vessel which has been exhausted, and which is three times as large. What is now the pressure in the two vessels?

32. In Example 31, suppose the first vessel contained air at 5 atmospheres, and the second vessel had been twice as large, what would be the new pressure?

33. In Example 31, suppose the pressure had been 2 atmospheres, and the second vessel twice the volume of the first, what would be the new pressure?

34. The volume of a gas increases 30 c.c. What is its volume and what is its density when the pressure is halved, doubled, trebled?

35. A volume of gas V at a pressure P is subjected to a new pressure P_1. Write a formula for finding the new volume V_1.

36. Rearrange the formula in Example 35 so as to facilitate the calculation of (*a*) P, (*b*) V, (*c*) P_1, assuming in each case that the other three are known.

37. Two rectangles are $l'' \times b''$ and $2l'' \times 3b''$ respectively, where l'' stands for the length and b'' for the breadth. How much greater is one than the other?

38. Two rectangular blocks are $l' \times b' \times t'$ and $2l' \times 3b' \times 4t'$ respectively. Find how much larger one block is than the other.

39. Two pieces of metal are of equal weight. One has a density of 9 and the other has a density of 7. The volume of the first is 10 c.c. What is the volume of the second?

40. If x kilometres represent the same distance as y miles. $x = \frac{8}{5}y$. Find the number of kilometres corresponding to 5, 10, 15, to 30 miles. Draw a graph, and find the number of kilometres in 13 and 27 miles, and the number of miles in 12 and 23 kilometres.

41. C is the circumference of a circle, and r is the radius. What is C equal to? Read off from a graph the circumference of a circle of diameter 5·5″, and the radius of a circle of circumference 17″.

42. Look at your straight line graphs. Suppose you wanted to find the angle which the straight line makes with the horizontal. Will the variables give you any of the trigonometrical ratios? If so, which? Does the slope of the curve increase or decrease with the angle? Is one of the trigonometrical ratios a measure of the slope? If so, which?

Section XXIII.

The students have now examined the more apparent properties of solids, liquids, and gases at the ordinary temperature, and it is a natural step to inquire into the effects of heat and cold upon common substances. In order to maintain and develop mathematical knowledge and dexterity, the changes which matter undergoes should be investigated quantitatively, and this involves thermal measurements. Even the simplest of these, however—thermometry—is so dependent upon other phenomena that the little investigations which have been characteristic of previous sections cannot profitably be undertaken until the students have surveyed qualitatively the country they are about to explore.

Few students are entirely ignorant of thermal phenomena; but their individual impressions and interpretations will vary considerably, and will form a very unsatisfactory basis, in a raw state, for logical procedure.

The general aim of the section, therefore, will be to correct, consolidate, and extend the experiences of the class, and the teacher may commence more or less on the following lines: What happens when water is heated? What happens to water in cold weather? What is the effect of heating iron? (Elicit from the class the several effects in this case.) What happens when wood, coal, etc., are heated? What is the effect of heating lead, copper, etc.? Show the effect of heating platinum, magnesium, glass, etc. Do any of these changes last for any length of time after the source of heat is removed?

In this way a group of experiences is collected and enlarged, and attention having been called to the two kinds of alteration—temporary and permanent—the latter may be reserved for later consideration.

The aim of the section will now be clear. The students will want to know what is meant by hotness or coldness—whether any change in size occurs when a body is heated; what really happens when a substance changes its state; how heat or cold passes from one body to another, and so on. The teacher may therefore devote an evening or two to the demonstration in a qualitative way of the chief phenomena of expansion, change of state, and the transference of heat.

This is the time to dwell on such applications to everyday life as do not require numerical statement as to temperature or quantity of heat involved. Thus reference should be made to the immensity of the force of expansion or contraction and its application, to the obvious phenomena of distillation, to the importance of change of state in enabling casting to be carried on, to the effect of sudden change of volume with change of state, to the use of copper for the fire-boxes of steam boilers and of asbestos for coating the outside of steam boilers and pipes, and to such other illustrations as may be suggested by the occupations of the students.

However unnecessary further advice may appear to be, experience shows that it is desirable to emphasise the importance of avoiding any explanation at this stage of the nature of heat. The students must concentrate their attention on the common phenomena of the science. The writer has had no end of trouble with students who have acquired from some text-book certain set phrases about "ether waves" and "molecular vibrations." The use of such phrases appears to be held as indicating knowledge, whereas in hundreds of cases it is nothing but incoherent babbling about matters which the user does not understand.

Section XXIV.

The attention of the students may now properly be directed to the need of some instrument to determine the relative hotness of bodies. There should be no difficulty in obtaining the suggestion that increase in size may be used to determine hotness. An experiment or two and a little discussion will show that the smallness of the expansion of solids renders them unsuitable for the purpose, and that recourse must be had to liquids or gases.

The construction of a liquid-glass thermometer should then be described, and if possible, each pair of students should fill one for themselves.

The next step will be the determination of the fixed points. The students should immerse a thermometer in clean water, in water containing a solid in solution, and in the steam from both; and the height to which the mercury rises in each case should be noted. Similar experiments should be made in which clean ice and ice containing salt are used.

The observation that the phenomena of boiling take place at the surface of the liquid suggests an inquiry into the effect of pressure.

As there is no special reason for performing one of these experiments before the other, two or three pieces

of apparatus may be set up for each experiment, and the students can pass from one to the other, completing the whole set well within the normal period of a lesson. They should then write out the conditions under which the fixed points on a thermometric scale may be determined.

The next step will be for each student to examine and compare the Centigrade and Fahrenheit scales. They should be encouraged to state the result of their examination in the following way :—

$$\frac{\text{Distance above freezing point on F. scale}}{\text{Distance above freezing point on C. scale}} = \frac{180^\circ}{100^\circ} = \frac{9}{5}.$$

But if F.° is any temperature on the Fahrenheit scale the number of degrees above freezing point is F.° − 32. If therefore C.° is the corresponding temperature on the Centigrade scale

$$\frac{\text{F.} - 32}{\text{C.}} = \frac{9}{5}.$$

$$\therefore 5\,\text{F.} - 160 = 9\,\text{C.}$$

Let the class give certain values, 10, 20, 30, 40, etc., to find the corresponding values of C., and plot the curve. Ask them to note the shape of the curve. Compare the equation and the curve with those obtained for Boyle's law. Is there any relation between the "form" of an equation and the "form" of the corresponding curve ?

To test this give each member of the class an equation in x and y. Let each one give x a series of values, find the corresponding values of y, and plot the curve. The reason for giving each student a different equation to plot will be clear.

Ask the class which quantities in their equations are constant, and which are variable. Then cast the temperature equation in the form

$$\text{F.} = \frac{9}{5}\,\text{C.} + 32,$$

and compare it with the standard form $y = ax + b$, where x and y are variables and a and b are constants.

Suppose $b = 0$, then $y = ax$. Compare this with the ratio of the circumference of a circle to the diameter $\frac{c}{d} = \pi$, or $c = \pi d$. What was the form of the curve obtained by plotting the radius $\left(\frac{d}{2}\right)$ and the circumference ? Hence get the class to see the relation between an equation and a curve.

It will be desirable to give a little practice in plotting the position of points from their co-ordinates. A good class may have their attention drawn to the fact that a in the equation $y = ax + b$ is the tangent of the angle which the line makes with the x axis, and measures the slope of the curve. To find the significance of b, make $x = 0$ in the equation $y = ax + b$. It is then clear that $y = b$, and that b is the length cut off on the y axis by the straight line $y = ax + b$. This might have been gathered by noting that in the thermometric graph the line cuts the vertical axis at 32 units from the origin, and 32 corresponds to the constant b in the standard form. In order to bring out the relation more fully, a few curves corresponding to the equation $\frac{x}{y} = \text{constant}$ may be plotted and compared with those already drawn.

A few easy simultaneous equations should be solved both graphically and analytically.

Before finally leaving the work of this section, the students should determine a few melting points. Attention should be drawn to the fact that some substances do not fuse sharply at a fixed temperature, but pass through an intermediate pasty condition. This property renders welding possible. If vapour pressure has not been demonstrated in Section XXIII., it may be appropriately discussed at this stage. It is particularly desirable to establish a clear notion of the boiling point as that temperature at which the vapour pressure of the liquid exceeds that of the atmosphere.

In centres where the students are engaged in chemical manufactures, the solvent properties of water may be treated rather more fully. Eutectic mixtures are of interest in connection with alloys (for example, solder), but the use of salt in clearing streets of snow can hardly receive satisfactory treatment until latent heat has been studied.

EXAMPLES.

1. Suppose you bought a thermometer, how would you test the accuracy of the freezing point ?

2. Suppose you had to test the boiling point on a thermometer, what kind of experiment would you carry out, and what other information would you require ?

3. Why cannot tea be made properly from water boiled in a kettle on the top of a high mountain ?

4. What kind of vessel would you use to boil an egg on the top of a high mountain ?

5. A student placed a thermometer which read up to 120° C. in a mixture of lead and tin in an iron cylinder over a flame. The column of mercury rose to the top of the tube, and then suddenly fell. What had happened ?

6. The bulb of a thermometer is plunged suddenly into hot water, and the mercury column first falls and then rises. Explain this.

7. The melting point of tin is 230° C. Find the melting point on the Fahrenheit scale.

8. Convert the following melting points to Fahrenheit temperatures—cast steel, 1370° C.; pig iron, 1075° C.; copper 1045° C.; silver, 954° C.; glass, 1100° C.; zinc, 412° C.; lead, 326° C.

9. Convert the following boiling points to the Centigrade scale —mercury, 676·4° F.; sulphur, 838·4° F.; turpentine, 314·6° F.; alcohol, 172·4° F.

10. Plot a curve for the conversion of Fahrenheit into Centigrade temperatures between −50° C. and 100° C. Find the Centigrade temperature corresponding to 0° F. and to −40° C.

11. An accurate Centigrade thermometer reads 71° when an inaccurate Fahrenheit thermometer by the side of it reads 156·2°. What is the error of the Fahrenheit thermometer ?

12. Plot the graph of the equations (*a*) $y = x$; (*b*) $y = x + 2$; (*c*) $y = x - 2$. Notice the differences.

13. Plot the graphs of the equations (*a*) $y = 2x + 3$; (*b*) $y = 2x$; (*c*) $y = 2x - 3$. Notice the differences.

14. Plot the graphs of the equations (*a*) $y = -2x$; (*b*) $y = -2x + 1$; (*c*) $y = -2x - 1$.

15. Plot the graphs of the equations (*a*) $y - 3 = 0$; (*b*) $x - 3 = 0$.

16. Plot the relation between x and y given by the equation $3x + y = 15$, and find the values of y corresponding to the following values of x, − 3, − 1, 0, 5, 7.

17. Solve graphically the equations

$$4y + 3x = 0,$$
$$y - 2x = 30.$$

18. Solve graphically the equations

$$2x + y = 0,$$
$$2x = y + 16.$$

19. Solve the equations

$$3x + 4y = 5$$
$$12(x + y) = -1.$$

20. A father is three times as old as his son, and the sum of their ages is 60. Find the ages of both.

21. The sum of the horse-power of two engines is 72, and the horse-power of one is greater than that of the other by 16. Find the horse-power of each.

22. The distance between two places is three times as great as the distance between two other places, and the difference is 48 miles. Find the distances.

23. The length of a room is greater than the width by 2 feet, and three times the width is greater than twice the length by 14 feet. Find the length and width of the room.

(*To be continued.*)

NATURE STUDY.

A STAGE—NOT A SUBJECT.

BY ERNEST A. SMITH, UNIVERSITY COLLEGE, NOTTINGHAM.

IN the educational discussions of the present day, questions of curriculum, and of method as implicated in curriculum, are the centre of interest rather than questions of method in the narrower sense. No topic has received more attention than that of Nature Study; but even now many people connect the term solely or chiefly with beetles and caterpillars, with sickly-looking seedlings attempting to grow in a box on the schoolroom window-sill, and so forth.

Others, properly enough, include observations and records of the weather and associated phenomena, together with direct study of the apparent movements of the heavenly bodies. It is perfectly astounding how few pupils, even from good schools, have the slightest idea that the sun does *not* rise in the east and set in the west, except twice a year, or that any other heavenly bodies rise and set at all.

Others, again, get so far as to recognise observations in quarry or dingle, on hillside or lakeside, which it would be pretentious to term physical geography, as coming under the vague and comprehensive term whose scope we are considering.

But the truth which seems to be gradually emerging is that, in fact, Nature Study is not a "subject" at all, but a method of dealing with any subject matter—at least on the realistic as opposed to the humanistic side; or, to put it in a rather different way, is a stage in the development of a child's mind with reference to each and all of these "subjects"—a stage requiring a characteristic selection and method of treatment.

What are the developmental stages? It is not possible to dogmatise, but with some diffidence the following may at least be put forward for consideration:—

1. The Nature Study stage, lasting until about eleven years of age—the period of naïve wonder, of delight in handling and generally "sensing" things, in finding out facts about them, not for the sake so much of making practical use of the knowledge as for the mere pleasure of the instinctive activity itself; a crudely imaginative period; one in which delight in expression, and in learning or trying new modes of expression, is keen, provided sufficient freedom be allowed; an age busy with the concrete and particular, with *things* in all the warmth of life, movement, colour, busy gathering materials for higher thought-structures by-and-by in an apparently unsystematic and omnivorous way. There is but little power of concentration or continuous thought for either intellectual or practical ends.

2. The problem stage, lasting approximately from eleven to sixteen years of age—the age of the heurist, of the pursuit of practical ends, of interest in the how and why of things in particular cases, interest in construction, in the "go" of things. There is now more power of concentration, more power to conceive certain ends and hold them firmly in the mind, bending all efforts to their attainment, less mere restlessness and destructiveness. Imagination is more disciplined, and, if enough scope is allowed, is becoming one of the mind's most useful and indispensable tools, the mainspring of all initiative, inventiveness, alertness, and effectiveness all round.

The growing complexity and co-ordination of the mind's knowledge and activities lead gradually to—

3. The systematic stage, from about sixteen onwards, in which something really worthy of the name of science becomes possible. It seems now agreed on all hands that the attempt to teach systematic science at an earlier age is a delusion and a mistake.

The developing mind now becomes capable of conceiving and pursuing definitely intellectual as well as practical ends.

Differentiation of mental types, which began to show itself in earliest infancy and has been noticeable all along, may here become very marked indeed if there has been sufficient play for individuality, or sufficient scope for the imagination, which amounts to much the same thing.

The above is a mere sketch, and it must be borne in mind that the stages merge gradually into each other; also that the ages are only average approximations. But although development is continuous, most teachers will recognise that about the ages of eleven and sixteen there is a rather more marked change; and it is noteworthy that these ages are becoming recognised as the best for leaving the primary for the secondary school on the one hand, and on the other hand for leaving the ordinary secondary school for business or for the middle grades of technical training.

That with regard to the humanistic subjects somewhat analogous stages are gone through may be suspected, but is a matter for further consideration.

Coming now to the application of all this to the curriculum of the primary school, and especially the Nature Study stage, several lines of thought suggest themselves.

(*a*) Remembering that the attitude of the pupil's mind and the reactions he makes are the important things, rather than this or that particular group of objects or phenomena, it will at once be obvious that children will study what lies to hand, and that the course for a town school will differ markedly from that for a country school.

While there is a natural interest for most children in plants, and still more in animals, and although enthusiastic teachers have shown zeal one can only admire in trying to develop that sort of "Nature Study" in town schools, it may be doubted whether—in some cases, at least—the result is quite worth the immense amount of trouble involved.

True, Nature Study involves the observation of something, the doing of something, and the expression of something by every child, and should be sharply distinguished from *stories about things*, however well "illustrated." Not that the value of these latter is denied—rather, indeed, very strongly affirmed, now as in a former article—by the present writer.

(*b*) The principle of correlation is, after all, of somewhat limited application. The obsession of some teachers' minds with the idea has led to ludicrous results. Throughout life the mind finds its greatest relief in thorough change of occupation and interest, and very frequent change is an absolute necessity for children at the age we are considering. While we may and must group lessons into series, and connect one subject with another to some extent, we can in the long run only follow Nature's lead in the apparently haphazard acquisition of heterogeneous facts and ideas by the child. We must introduce system gradually, and with great care, to avoid disastrous fatigue. On the other hand, later on, such things as mathematics, science, and geography should be far more thoroughly co-ordinated than they often are, even nowadays.

(*c*) One way, and a very good way, of correlating school work which has now come into general use in the best schools, is frequently to base composition and drawing lessons on some of the oral lessons which have preceded. But as regards true Nature Study, observation and expression should go together, and there should be the utmost possible freedom of expression. We are, perhaps, not yet fully alive to the value of what may be called the mixed lesson, which may last as long as an hour, or even more, even with comparatively young children. The change given by constantly going from handling, observing, and experimenting with things to answering questions about them; to expressing in various forms of words what has been learned; to writing down in their own composition and at once these facts, sometimes making drawings or diagrams, as much as possible in their own way, and in the natural way, when and as required, renders possible without undue fatigue these long lessons. Time passes quickly and pleasantly, so natural is the method.

Freedom of expression has been mentioned. The usual plan pursued—at least by young teachers—is to accept one answer or sentence, often no better than several others which have been given, and to write it down on the blackboard for every one else to read or copy. In lessons of the type contemplated above, *nothing whatever* should be copied from the blackboard. Children should gain the ideas, and then express or apply them individually in their own way, a word of encouragement being always ready for anything showing originality or ingenuity.

(*d*) While real mathematics, science, and geography are not for the primary school, as indicated above, the Nature Study should lay the foundation for each and all of them, the emphasis varying with the locality.

The ideas put forward in this article were embodied in lectures to students, and a short series of lessons was given in demonstration, apparently with great pleasure to all concerned. Mathematics was chosen, in the first place because it seldom occurs to young teachers that the subject has a Nature Study stage at all; secondly, because of the immense intellectual and practical importance of mathematics, especially in towns, where so many of the children become, or ought to become, skilled craftsmen; and thirdly, because, with a little trouble, the whole could be carried out with the ordinary appliances of a school. The children were in the lowest class available, the lower division of Standard III., but something similar could be done with even younger children. They had drawing and writing-paper, and used, at different times during the lessons, ruler, compasses, and scissors. An equilateral triangle was hectographed and given out on one occasion.

The children learned what an angle is, what does and what does not determine its size, the comparison of angles by superposition, what a right angle is ("like a square corner"), that all right angles are equal, that in a figure in which, from a point in a straight line, several lines are drawn, all on one side, the angles so formed are together equal to two right angles, or when on both sides, four right angles.

They drew and labelled figures to illustrate these points, quite in their own way, of any size, in any position, and with any variation not affecting the truth and relevance of the figure, copying nothing from the blackboard. They also wrote, in their own words each time, statements of the important truths learned.

Next they learnt how to draw a circle with compasses, and from their method of drawing it was discovered that all straight lines drawn from the centre to the "boundary" were equal. Drawings and statements as before, and all through the lessons.

Next came the equilateral triangle. This was examined, turned different ways, and its sides measured. They named it an equal-sided triangle. Very interesting was the next point: with a little thought they found out how to draw one for themselves. They did so, cut it out with scissors, turned it different ways, and by folding discovered that all its angles were equal. It was also superposed on the hectographed triangle. The children then drew a larger one, cut it out, and repeated their experiments without detailed directions, discovering in addition the surprising fact that the angles of the larger triangle were equal to those of the smaller one.

The isosceles * triangle followed. Children at once saw how to draw one, did so, cut it out, and discovered that the angles opposite the equal sides were equal.

The next was rather more difficult, yet followed naturally. Two exactly equal scalene * triangles were drawn, the sides labelled A, B, C, and the opposite angles *a*, *b*, *c*. One was left for reference, the other cut out, and by experiment again the truth learnt that the greatest angle is opposite the longest side, and so on. Lastly, all the marked "corners" were cut off, placed together, and the further surprising fact learnt that the three marked angles were together equal to two right angles.

The series had now served its purpose, and circumstances did not admit of its being carried further; but it could be easily modified and extended in all sorts of ways.

There could be no question as to the "natural appeal" of the lessons. The children's love of activity, of manipulating and finding out about things, their delight in expression, and in introducing little variations of their own, were all gratified, while there was nothing abstract, unsuitable, or difficult all through.

This sort of work is true Nature Study; and it may be claimed that, as compared with similar work in other branches, Nature Study geometry is pre-eminently inexpensive and practicable.

* Needless to say, the terms isosceles and scalene were not used.

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Papers for Teachers of Infants.

A TALE FOR THE STORY HOUR.

"COME OUT TO PLAY."

BY LILY FRITH.

EVA was in bed and awake. There is a pleasant sort of wakefulness, when you feel that bed is the very nicest place in the world, and that, having got there, you never intend to leave it: you usually change your mind next morning; but that is a different matter. Eva's was not that sort of wakefulness; she felt that the two *stupidest* things in the world were bed and sleep. So, you see, she was just in the mood for changing, if she should have the chance of anything nicer. While she was lying in this mood she heard sounds coming from the street. At first it sounded like bells tinkling faintly; then it seemed as though the bells were coming nearer, and were beginning to talk. Again she listened very carefully, and heard the words of that old rhyme in her nursery book that she had always called rather silly. There they were, however, and they didn't sound silly at all; they sounded delightful and *very* sensible. She supposed it was the way they were sung. Eva listened once more, and heard:—

> "Boys and girls, come out to play,
> The moon is shining bright as day;
> Leave your supper and leave your sleep,
> And come to your play-fellows in the street."

"Well, I've had my supper," thought Eva, "so I shan't have to go without that; and as I don't really want any sleep, I'll just see who it is." She clambered out of bed, ran to the window, opened it, and looked out. There in the street were hundreds of tiny beings. "*Fairies*," thought Eva, and clapped her hands.

The fairies heard her and looked up; then a few of them lightly climbed up the spouts and on to the window-sill. They told this wakeful little girl that now and again they came out like this to give any little child who wished it a glimpse of fairyland. Also they told her that usually it was "fairy-like" little girls like herself—Eva had very long fair hair and very blue eyes—who heard their call. They offered to take her with them for a night in their fairy country, and bring her back in time for breakfast in the morning. She had only her nightdress on; but the little people told her that would be quite warm enough for the journey, so she agreed to go with them. At once the fairies put their hands under her, and she felt herself float lightly through the air down to the street below, where the waiting fairies raised a joyous "whoop and call." Eva was afraid they would awaken her mother; but her friends explained that only people who believed in fairies, as she did, could hear them, so she didn't bother any more. She was then placed on a dainty carriage with silk cushions, that seemed to have been waiting to make her feel comfortable, for they instantly settled themselves *round* her somehow, and "cuddled" her, as it were. The fairy folk surrounded the carriage, and the whole party moved on. I say "moved," but you could scarcely have called it "moving;" Eva never *felt* that she had left her own door until she looked out and saw that she was at the bottom of the street, and that the fairies were about to turn round a corner which she had never known to be there before. This corner turned, she saw that they were on a long, straight, hilly road, very broad, very white, and very bright.

The curious thing about it was that there seemed to be nothing on each side of it to "keep it in;" no houses or shops, not even a wall to show you which was street and which was something else. As for this "something else," it was too far off to tell really what it was: it *might* be fields; but if so, the grass had changed colour, and was dressed in blue instead of green. Eva was deeply engaged in wondering about this and other matters, but the fairies did not seem at all puzzled; they trotted and tripped, laughed and sang, until what seemed to be a lovely palace came into sight at the end of the street. Eva timidly asked the fairies if they were going there, and were they taking any other visitors besides herself. These little people said they *were* taking her there, but she was the only visitor, as they were not allowed by the owner to take more than one at a time: although they sang "boys and girls" in their song, they knew the invitation could only be taken by one boy or one girl at a time. While they had been having this little chatter they had got much nearer to the palace, and Eva saw that it was pearly looking. It was rather like the handle of a pocket-knife, only the colours were in bigger patches: green, pink, and silvery white shone out in the light, sometimes in one place, sometimes in another; they were constantly changing places with each other, and making you wonder what it really was you were seeing. It was the sort of sight that would very soon make you think you could *not* believe what your eyes told you. Eva had once heard some one say that "the world was like an oyster," and as this palace seemed to be very oyster-like—inside of the oyster shell, of course—she concluded it must be the world. She asked the fairies, but they knew nothing about oysters, except that oyster shells were rather nice to live in, if you happened to be a sea-fairy. They explained that this was the front of the palace of the moon, and that it was surrounded by a sea. The water in this sea seemed to have caught some of the colours that were flashing about the front of the palace, and so had made itself look very much like that palace.

Just as the fairies finished telling this, the carriage reached the edge of the water, and Eva was gently lifted, cushions and all, from it into a tiny boat which was waiting for her. The boatman was a queer little person dressed in green, who explained that his master, THE MAN, was busy arranging the night light for the people below on the earth, and so could not receive visitors, but had sent him instead to take the little girl for a sail round the palace. Eva's friends laughed, and talked to the little man, told him all the news from their part of fairyland, and he in return told them his. All the gossiping, however, was over in a few seconds, which shows how *very* clever fairies are; then they all hopped into the boat beside Eva. The boat was pushed off from the shore, and the boatman steered up to the door of the palace, so that the girl passenger might peep into it and see the lovely oyster-like floor and walls. There were also chairs, a clock, and pictures of the sea with frames of the same pretty material. The tiny green man only stopped a second; he knew that visitors had sometimes been tempted to run in, that the MAN had been very

angry, and that terrible things had happened for days after; so he very wisely moved his boat away before this could take place with *his* visitor. Everything was so bright, and the boat seemed to be made to rock so gently, that Eva closed her eyes to enjoy better the delicious sensation she could feel creeping all over her. It began in her back, gradually spread itself to arms and legs, and finished up inside her somewhere. It made her feel very happy indeed. "Hush! she sleeps," murmured the fairies. *That* wakened her up quick. "Sleep!" she cried, "this isn't sleep; sleep is a stupid thing that I left at home, as you told me when you called from the street." The fairies apologised; they meant "fairy sleep," which is very, very different from ordinary sleep. Then *Eva* apologised—that explained the delicious sensation—and they were all good friends again. The passenger kept her eyes *open* after that, but she still had the nice sensation that began in her back, and stretched all over her. She watched the strange birds that flew by, the strange trees on the tiny islands, and the strange ships that passed them on the sea. Everything she saw was of the same colour as the palace and the furniture, except the tiny people in the boats, who wore suits of green exactly like the one *her* boatman wore. After a long, long float, they came back to the front of the palace, the carriage was waiting, the fairies placed their charge within it once more, and the procession started off down the long shining road to the village street. At the door of Eva's house they stopped. A party of them floated up to the window with her in their arms, and laid her in bed. Then they sang "Rock-a-bye, baby," so drowsily that the little girl was very soon soundly sleeping, and they left her to go and fetch some other little person "out to play."

A CORRELATED SCHEME BASED UPON ÆSOP'S FABLES.

"The Fox and the Goat."

ONE hot day a fox fell into a well. Though the water was not deep, the top of the well was beyond his reach, and he could not get out. At length a goat came by, and looking over the well saw the fox. The goat asked the fox if the water was good. "Indeed, it is," replied he. "Come and have some before I drink it all." The goat jumped into the well, and the fox immediately sprang on his horns, and so got out. Looking over the edge of the well, he called out to the poor goat, "If you had half as much brains as you have beard, you would look before you leap."

Reading.—A. L. Æsop's Fables, No. 4.

Object Lessons.—1. The Fox.

Illustrations.—Picture of fox. Picture of fox-hunting. Sketch of head of fox. Head of dog. Fore and hind paws of fox.

Preparation.—Connect with fable. What happened to the fox? Why could he not get out? Why did he want the goat to jump into the well? What did he say to the goat? Was not the fox very cunning? What other cunning animal have you been learning about?

Presentation.

1. *Description.—The fox is a wild animal of the dog tribe.*—Make children compare picture of fox with picture of dog; also sketch of head of dog with sketch of head of fox.

2. *Structure.*—By careful examination of picture of fox lead children to note that—

(1.) *The body* is long and flexible.

(2.) *The skin* is covered with thick fur of a reddish-brown colour, marked with white and gray. [Tell children that in very cold countries the fur becomes white in winter.]

(3.) *The head* is long and pointed.

(4.) *The eyes* are keen and bright. [Tell children that in a strong light the pupils contract, like those of the cat.]

(5.) *The ears* are short and erect. Compare with the ears of a terrier.

(6.) *The teeth* are strong, sharp, and pointed.

(7.) *The legs* are slender.

(8.) *The paws* have five toes on fore feet and four toes on hind feet. [Show sketch of paws.]

Head of Fox.—(Outline Drawing.)

(9.) *The claws* are strong and blunt. Compare with claws of cat. [Show sketch.]

(10.) *The tail* is long and bushy. [Tell children it is called "a brush."]

3. *Habits.*—(1.) *The fox lives in a hole called its "earth,"* which it digs in the ground, generally under low bushes. Make children note—

(*a*) *How formation of paws and tail* helps the fox to dig out hole.

(*b*) How colour of fur resembles colour of soil, and so helps fox to hide. Lead children to suggest why the fur of the fox becomes white in cold countries.

(2.) *Kills and eats* fowl, hares, rabbits, etc.

Head of Greyhound.—(Outline Drawing.)

(3.) *Catches prey with mouth*, not with claws. [Refer to habit of dog, and compare with habit of cat.] Make children examine and compare sketches of paws of fox and paws of cat.

(4.) *Hides by day*, and hunts by night. Lead children to suggest reason of formation of eyes.

(5.) *Is cunning and cowardly.* By reference to fable, lead children to suggest this. [Tell children how, if caught, a fox will often pretend to be dead.]

(6.) *Has a very strong* and unpleasant smell.

4. *Fox-hunting.*—Show picture and describe. Lead children to suggest that the strong smell of the fox helps the dogs to follow. [Tell children that foxes have nearly always two coverts at a considerable distance from each other, and when unearthed at one generally make for the other.]

Reading.

Sound, *ush.* Hush, rush, gush, brush, crush, blush, plush.

Hush! Do you see that fox? Where? There by those rushes, just where the stream gushes out of the hill. Do you not see the tip of his brush? Hark, here comes the hunt. See, the fox is running up the hill. On rush the dogs; see how fast the hunters ride. Ah, the fox is caught. Look how the dogs crush each other. See the man in the red plush coat has cut off the fox's brush.

2. The Goat.

Illustrations.—Picture of goat. Sketch of goat's hoof. Picture of Swiss goatherd.

Preparation.—Question on fable. Bring out the fox's allusion to the goat's beard.

A Horse's Foot.

A Goat's Foot.

Presentation.

1. *Appearance and structure.*—By examination of a picture of a goat lead children to describe—

(1.) *Horns* long, curving backwards.

(2.) *Shape of head*, long and rather pointed.

(3.) *Beard* long, growing under chin.

(4.) *Covering of body*, long fine hair. Compare with covering of sheep.

(5.) *Cloven hoof.* Show sketch of goat's hoof, and compare with sketch of horse's hoof.

2. *Habits.*—When wild, lives in mountainous places. Can spring easily from rock to rock. [Lead children to see use of cloven feet.] Lives on short, coarse grass. Can be easily domesticated and kept where the grass would be too poor to feed cows. Hence sometimes called "the poor man's friend." Young goats are called kids.

3. *Uses.*—(1.) *Gives milk*, from which butter and cheese are made. Tell children that in some countries large flocks of goats are kept. Describe Swiss goatherd, and show picture.

(2.) *The flesh* of the goat is used as food.

(3.) *The hair* is made into ropes, wigs, etc. Tell the children that the hair of one kind of goat is made into cloth.

(4.) *The horns* are made into combs, knife-handles, etc.

(5.) *The skin* is made into leather.

(6.) *The hoofs* are made into glue.

Reading.

Sound, *ock.* Block, crock, dock, flock, frock, lock, mock, rock, stock, o'clock.

Here is a picture of a boy and his flock of goats. He is sitting on a block of stone. At six o'clock he will bring the goats home to be milked. The milk will be put into a crock and made into cheese. When he has a good stock of cheese, he will sell it, and buy a new frock for his sister.

3. Leather.

Illustrations.—Some pieces of leather. A picture of an oak tree. Picture of goat.

Preparation.—Connect with fable and with lesson on goat.

Presentation. — 1. Make children examine piece of leather, and compare with goat's skin. Lead them to suggest that *the hair has been removed.* Describe how the skin has been soaked in lime water and well scraped.

2. By questioning on the uses of leather lead children to suggest—

(1.) *Leather should be able to "keep out water."* Describe how skins are steeped in pits of tannin; show picture of oak tree, and tell children that tannin is made by steeping the bark in water. Let some children touch a piece of alum with the tip of the tongue, and notice result. Tell them tannin dries up the skins in the same way.

(2.) *Leather should be soft and flexible.* Explain how skins are beaten and rubbed to effect this, and how they are dyed with lamp-black and oil.

Reading.

Sound, *eep.*

One day I went to the tanyard to see the men steep some skins. I took a peep into the deep pit. A man called out, "Keep away from the side of that pit; it is very deep, and we don't want to steep you as well." I saw a big dog asleep near some sheep-skins. I asked one of the men if he was going to steep the sheep-skins too, and he said, "Oh yes, sheep-skins make very good leather. We keep the skins steeping for a few weeks." Just then I saw a mouse creep out from behind the sheep-skins. The dog woke from his sleep and began to bark.

Teacher's Illustration.

4. A Well.

Illustrations.—Picture of woodland well (see above). Picture of well and bucket.

Preparation.—Revise previous lesson on the water supply in towns. Tell children that people living in the country often have no water-taps, but get their water from wells.

Teacher's Illustration.

Presentation. — 1. Show sketch of woodland well, and get children to describe it. Refer to fable of "The Crow and the Pitcher," and tell children a pool is rain water, and soon dries

up; but in a well the water comes out of the ground, and does not often dry up.

2. Show sketch of well with bucket and chain. Explain how men are sometimes obliged to dig very deep before a well is reached. Lead children to suggest—

(1.) Use of bucket and chain.

(2.) Why a wall is built round the well.

3. Value of wells. Tell children that in some countries where water is scarce, wells are taken great care of, and even given names. Remind children of how our Lord sat by Jacob's Well.

Reading.

Sound, *ink*. Link, pink, rink, sink, brink, drink, think, wink.

Tom and May went for a walk in the woods. May had on a pink frock and a link of blue beads. It was very hot, and Tom said, "Let us sit on the brink of this well and get a drink." "I do not think," said May, you can get up the bucket." "Oh yes, I can, if you will help me to turn the handle." So May and Tom set to work, and at last up came the bucket. They had a nice drink. May looked over the brink of the well to see how deep it was, but, sad to say, her link of beads fell off, and she saw it sink, sink down. "Do not cry," said Tom, "I will get you another link." So May tried to wink away the tears. I think Tom was a kind boy. Do you?

Writing.

Look at this fox. He fell into the well and could not get out. He asked the goat to jump in and have some of the water. When

Sketch for Colouring.

the goat did so, the fox jumped on his horns, and got out, but the poor goat was left in the well. The fox called out to him, "Why did you not look before you leapt?"

Recitation :—

The Well of St. Keyne.

A well there is, in the West Country,
And a clearer one never was seen;
There is not a wife in the West Country
But has heard of the well of St. Keyne.
An oak and an elm tree stand beside,
And behind does an ash tree grow,
And a willow from the bank above
Droops to the water below.

The Silly Goat.

A cunning old fox fell into a well,
And did not know how to get out.
A old silly goat, who strayed from the flock,
Was quietly browsing about.
"Jump down," cried the fox, "I'll jump on your back;
And when at the surface again,
I'll catch your two horns, and pull you safe out
Without either trouble or pain."
The foolish old goat believed all he said,
And jumped down quite lively and gay;
The fox scrambled out, and then, with a bow
And loud, mocking laugh, scampered away.

TUTORIAL COLUMN FOR THE ELEMENTARY CERTIFICATE OF THE NATIONAL FROEBEL UNION

Introductory.

THE importance of the early training of young children on right lines is now generally recognised, and the aim of this column is to help the teachers of such children to make acquaintance with the latest and best literature on the subject. It is also intended to help teachers who are desirous of obtaining a kindergarten certificate, and who are unable to attend lectures and classes, to obtain an insight into the kind of preparation necessary for the examinations of the National Froebel Union.

A list of suitable books is attached to the syllabus of work for the Elementary Certificate issued by the National Froebel Union mentioned above, which readers are requested to preserve for future reference. Other books will be mentioned later. Those recommended as *text-books* should be purchased, if possible, as they are necessary for detailed study, and those mentioned as *reference books* should be borrowed and read very carefully. Those unable to get these books locally can borrow them by becoming members of the Froebel Society, which has branches in various parts of the country. Full particulars can be obtained from the secretary, Miss Temple Orme, 4 Bloomsbury Square, London, W.C.

Examination questions upon the various subjects will be printed each month for the convenience of students.

All communications or inquiries should be addressed to the Office of this Paper, endorsed "Froebel Union," before January 6, and will be answered, if possible, in the next issue.

Syllabus for 1910.

1. *Knowledge of Child Nature.*

The child as a physical organism. The conditions of healthy growth and development of children, with special reference to food, sleep, warmth, clothing, cleanliness, fresh air, exercise.

The stimulus afforded by the child's environment; the child's response through its activities (play, curiosity, imitation, etc.). The child's interests and capacities. The formation of habits. The means of building up ideas and encouraging various modes of expression through the child's activities. The kindergarten as supplying the conditions necessary for right development.

Text-books.—Some Characteristics and Requirements of Childhood, by Alice Ravenhill (E. J. Arnold. 9d. net). *The School and the Child*, by John Dewey (Blackie and Son. 1s. net).

Reference Books.—Talks to Teachers on Psychology, by William James (Longmans, Green, and Co. 4s. 6d.). *The Development of the Child*, by Nathan Oppenheim (Macmillan. 4s. 6d.). *Child and Child Nature*, by Baroness Von Bülow (Sonnenschein. 3s.). *An Introduction to Psychology*, by J. H. Wimms (Charles and Dible. 1s. 6d.).

2. *Practice of Education in Kindergarten and Transition Classes.*

The provision made for the child's development at successive stages between the ages of three and seven, by means of games, stories, verse, observation of physical and social environment, and employments of various kinds. The means of giving ideas of number, size, weight; and of training in language. The beginnings of formal training in writing and reading.

The conduct of classes for children in the transition stage, before entering the school proper (ages about seven to eight). Instruction-material suited for this stage and its treatment.

Text-books.—Froebel's Mutter-und-Rose-Lieder (*Mother's Games and Songs*), translated by Frances and Emily Lord (William Rice. 2s. 6d. net). *Old English Games and Physical Exercises*, by Florence Kirk (Longmans. 2s.)

Reference Books.—*Talks on Teaching*, by Colonel Parker (Kellog and Co.). *Principles of Class Teaching*, by J. J. Findlay (Macmillan). *Principles of Education*, by T. Raymont (Longmans. 4s. 6d.). *Froebel's Educational Laws for all Teachers*, by J. L. Hughes (Appleton. 6s.).

3. *Class Teaching.*

Candidates will be expected to occupy a class of children of any age between three and eight for forty-five minutes in a manner suited to their stage of development, and with due regard to their need for variety. The following are some suggestions from which a selection could be made:—

(1.) *Giving a lesson*—for example, a nature lesson or a lesson on a trade, occupation, etc., or some other feature of the child's environment, or a lesson showing the candidate's power of making interesting and clear a formal subject such as reading or writing.

(2.) *Telling a story.*

(3.) *Conducting a game*—for example, the dramatisation of a story, or of the ideas gained in a lesson; a game of the type given in Froebel's *Mother Songs*, or any other suitable form of game.

(4.) *Superintending the children's play* with such material as sand, building blocks, or with any of Froebel's gifts.

(5.) *Superintending the children's employment* in any definite form of handwork.

N.B.—Some form of game is obligatory.

Notes must be prepared, showing the proposed programme for the period.

Text-books.—*Nature Study and Fairy Tales*, vols. 1 and 2, by Catherine I. Dodd (Nelson and Sons. 3s. 6d. each volume). *Children's Rights*, by K. D. Wiggin (Gay and Bird. 3s. 6d.).

Reference Books.—*Theory and Practice of Teaching*, by Edward Thring. *Thirty Years of Teaching*, by L. C. Miall. *Point of Contact in Teaching*, by Paterson Du Bois. *Froebel's Pedagogics of the Kindergarten. Froebel's Education by Development.*

4. *Blackboard Drawing.*

(1.) *Memory Drawing:*

(*a*) Sketches illustrating the life history of a common wild flower, which has been studied by the candidate in connection with nature knowledge.

(*b*) Details of external structure of *one* insect, *one* fish or crustacean, and *one* quadruped, the selection being left to the candidate.

(*c*) A sketch of a natural object or a cast shown for a few minutes, and then withdrawn.

(2.) *From nature*—flowers, leaves, and fruits.

(3.) *Enlargement of an outline sketch*, provided at the time of examination, of landscape, seascape, or building.

Text-books.—*Elementary Lessons in Freearm Drawing*, by F. Hewitt (E. J. Arnold. 3s. 6d.).

NOTE.—Teachers will find the articles on drawing, etc., appearing in this journal very helpful and suggestive. Plenty of individual practice must be given to this subject.

5. *Nature Knowledge.*

(1.) *Plant Life.*—The general structure of a plant and the uses of its different parts, illustrated by the simplest physiological experiments.

The flower, and the formation from it of the fruit.

The commonest means of seed dispersal.

The structure and germination of the seed of the sycamore, the pea (or bean), the acorn, and the maize (or wheat).

Vegetative reproduction by means of bulbs, corms, and tubers.

Special study of the growth and development of the crocus, daffodil, snowdrop, and potato.

The life history and structure of the buttercup, pea, foxglove (or snapdragon), and dandelion.

Pollination on the visits of insects to flowers.

The recognition of the following British trees throughout the year, including their flowers and fruits—oak, sycamore, horse-chestnut, pine, hazel.

The study of the winter resting bud of the beech.

N.B.—Special reference should be made throughout the course to the environment and habits as well as to the structure.

(2.) *Animal Life.*—The general characteristics, habits, and life histories of the following—

(*a*) Cat, dog, cow, horse, sheep, rabbit, and dormouse.

(*b*) Fowl, pigeon, sparrow, robin, thrush, and blackbird.

(*c*) Fish and frog.

(*d*) Bee, moth, butterfly, house fly, garden spider.

(*e*) Worm, garden snail.

N.B.—All these animals should be studied alive, and special attention should be paid to the adaptation of their structure and habit to the conditions of their life.

(3.) *Earth and Sky Study.*—(Chiefly in connection with gardening and the needs of plant and animal life.)

(*a*) Water, its general properties, and the importance of these to life.

(*b*) The sun, sunlight, the variations in its strength throughout the year, and the effect of this on plant and animal life.

(*c*) The earth, the dependence of life on the soil, different kind of soils, and their varying power of holding water.

(*d*) Observation of the sky, both by day and by night, and the reasons for the waxing and waning of the moon. The recognition of the following constellations—the Great Bear, the Little Bear, Cassiopeia, the Milky Way, Orion, and the Pleiades.

Text-books.—*A Year's Botany*, by Mrs. Kitchener (Longmans. 5s.). *First Studies of Plant Life*, by Atkinson and Wood (Ginn and Co.). *Object Lessons from Nature*, by L. C. Miall, 2 vols. (Cassell and Co. 2s. 6d.). *A Cycle of Nature Study*, by M. M. Penstone (National Society. 4s. 6d.).

Reference Books.—*The Study of Animal Life*, by J. Arthur Thomson (Murray. 5s.). *Nature Study and Life*, by C. F. Hodge (Ginn. 7s.).

6. *Educational Handwork.*

The objects of this section are twofold:—

(1.) To test the candidate's own skill.

(2.) To test her capacity to choose suitable handwork for children of different ages, and to guide their work in the most educative manner.

Candidates will be examined (*a*) individually and orally, (*b*) by a written paper, which will include questions on the kind of work suitable for children between the ages of three and eight. Candidates will be required to show a certain amount of finished work at the individual oral examination. Details of the work required will be announced two years previously. Credit will be given for economy and variety of material, and for evidence of resource. No other work need be shown, but the candidate's practical knowledge of the following different forms of handwork may be tested at the oral examination:—

(*a*) Building with Froebel's gifts or other material.

(*b*) Modelling in clay or other plastic material.

(*c*) Basket-making in bast and cane.

(*d*) Handwork in connection with textile industries—very simple weaving, sewing, and knitting.

(*e*) Making toys, pictures, and other objects interesting to children.

(*f*) Drawing, painting.

Candidates should not only know how to make isolated examples of the above forms of handwork, but should also be able to combine them into groups—for example, doll's house and furniture, farmyard, scenes of primitive life, etc.

Special Educational Handwork. (*To be shown at Oral Examination.*)

For 1910.

Any three of the following:—

(1.) *Brush Drawing.*—Six specimens showing suitable subjects and treatment for children under seven, and three showing how children may begin to deal with effects of light and shade.

(2.) *Knitting.*—Six simple articles such as children of six to eight years of age could produce.

(3.) *Clay Modelling.*—Six specimens such as might be produced by children under seven, and two specimens of more advanced work.

(4.) *Constructive Paper Folding and Cutting* (preparatory to cardboard modelling).—Ten simple objects chosen so as to present sequence of difficulty, and such as children under seven could execute. Five objects to be produced merely by folding and cutting, and five to give training in the use of the ruler. Plans to be shown.

Text-books.—*Educational Handwork*, by F. Kirk (E. J. Arnold. 5s.). *Froebel's Gifts*, by K. D. Wiggin (Gay and Bird). *Froebel's Occupations*, by K. D. Wiggin (Gay and Bird).

N.B.—For the practical handwork, it is much better to have a few lessons or to attend courses taken by practical teachers. For further information write to the Editor of the *Practical Teacher*, the envelope to be endorsed "Froebel Union."

7. *Singing.*

(1.) To submit the names of four kindergarten songs, and to sing from memory (in any key suitable to the candidate's voice) one of those chosen by the examiner.

[*N.B.*—The literary and musical value of the song will be taken into account.]

(2.) To answer questions as to the key, rhythm, and other

points of notation belonging to the song, and also to indicate the best method of teaching the song to a class.

(3.) To imitate short phrases sung by the examiner. These may involve easy rhythms.

(4.) To sing at sight an easy test in any major key involving both time and tune. The time may be $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$, or $\frac{6}{8}$.

(5.) To answer simple questions on the best methods of ensuring good voice production from children.

As the examination in this subject is a practical one, and depends upon the pupil's own skill, no text-book can be recommended.

SCRIPTURE LESSONS FOR YOUNG CHILDREN.

THE STORY OF JESUS.—I. THE BABE IN THE TEMPLE.

BY MRS. FLORENCE KIRK.

Introduction.—The teacher should begin by showing the picture of the birth of Jesus, and repeating the words of the hymns mentioned in the November issue. Reference should be made to the story of David to explain the phrases "City of David," "Royal David's city," "Is born of David's line," "David's town," which occur in the hymns. For example: "A long time before Jesus was born a little boy named David lived with his father and brothers in Bethlehem, and herded sheep

THE BABE IN THE TEMPLE.
(Reduced from Nelson's Bible Wall Pictures.)

like the shepherds who came to see Jesus. He was a brave and good boy, and one time he killed a lion which was going to steal his sheep, and another time he killed a bear. When he was older he killed a giant called Goliath, of whom all the king's soldiers were afraid. Afterwards he became one of the king's soldiers, and the people loved him so much that, when the king and his son were killed, they asked David to be their king. Then he went to live at Jerusalem, and gathered a great many beautiful things to build a temple where the people could go to worship God."

When Jesus was a month old Joseph and Mary took Him to Jerusalem to present Him at the Temple, for this was the custom at that time. The law also required the mother to make an offering in the Temple. This offering should be a lamb one year old for a burnt offering, and also a pigeon or turtle dove. If the mother was too poor to buy a lamb, she could take another dove instead. When Joseph and Mary (who were only poor people) went to the Temple with their two doves, and to present their Son to the Lord, another joyful surprise was awaiting them.

In Jerusalem lived a very good and very old man named Simeon, who had been told by the Lord that he should not die until he had seen the One whom God had chosen to save the people from their sins. The Holy Spirit led him to the Temple just as Mary and Joseph were coming in with Jesus. He at once took the Babe in his arms, and began a song of praise to the Lord thanking Him for His great goodness, and saying that he was now ready to die. [To older children the teacher should read the song, see Luke ii. 29–32. Here produce the picture, and call attention to the various details—namely, the long white hair of Simeon, the flowing robes, the cage of doves, the arches and beautiful marble of the temple, the varied colours.]

Before Joseph and Mary left the Temple a very good old woman named Anna entered, and as soon as she saw Jesus she began to praise God for His goodness in allowing her to see this wonderful Baby.

Joseph and Mary made their offering, and then left the Temple, very much astonished, and with their hearts full of the wonderful things they had seen and heard. Then they returned to Bethlehem, where they lived for some time.

THE STORY OF JESUS.—II. THE WISE MEN OF THE EAST.

Introduction.—The teacher should begin by referring to the manners and customs in Eastern lands described in the first article. In those days people did not know many of the things which we know now. They used to think that the stars in the sky could tell them what was going to happen, and there were men who did no other work than to watch the sky and to notice what was occurring in the heavens. [Do you ever look in the sky at night and notice the different groups of stars? (The hymn "Twinkle, twinkle, little star," is a great favourite with little children, and should be learnt at this stage.) You remember the star which appeared in the sky to the shepherds the night when Jesus was born. (Repeat first two verses of "The First Nowell").]

On this night some Wise Men, who lived in a country a long way off towards the East, noticed a star in the sky which they had not seen before, and they said to one another, "There is a new king born in Judea; let us go and worship Him." They could not set out just at once, and as they had a long way to go, it took them a long time to travel, so that it was some months before they reached Judea. [Introduce conversation about camels and modes of Eastern travelling.]

When Jesus was nearly two years old, the people of Jerusalem were greatly excited by the visit of three Wise Men, who inquired where they could find the King of the Jews.

They said that many months ago they had seen a new star in the heavens, which was a sign to them that a great King had been born to the Jews, and that they

had come to Jerusalem, where the King had His home, to see Him and worship Him.

No one in Jerusalem knew anything about it, and when they told Herod the king he called the Wise Men, and asked them when they had first seen the star. When they told him, he said he believed they would find Him at Bethlehem, and urged them to go there and find out, and afterwards to let him know, so that he also could go and worship Him.

The Wise Men set out that night (in hot countries travelling is often done by night), and were delighted to find the same star again shining in the sky, for they had not seen it since they left home. Wonderful to say, it now went before them from Jerusalem to Bethlehem to show them the way, and stood still over one of the houses in that city. They did not ask any one this time, but went straight in, and found the Baby Jesus in His mother's arms. They were so delighted that they threw themselves on the ground before Him, and brought out their treasures of gold, frankincense, and myrrh, and offered them to him, for these were

THE WISE MEN OF THE EAST.
(Reduced from Nelson's Bible Wall Pictures.)

the presents usually offered to kings. [Here show the picture, and call attention to the various details—for example, the venerable appearance of the Wise Men, their rich dresses, the caskets containing the presents, the camel outside the door, the houses of the city, the curious earthenware vessels standing on the floor for water or oil, the lantern fastened to a stake in the ground, the excitement of the neighbours flocking in to see what was taking place. Teach the next verses of "The First Nowell"—for example :—

"And by the light of that same star
Three Wise Men came from country far;
To seek for a King was their intent,
And to follow the star wherever it went.
The star drew nigh to the north-west,
O'er Bethlehem it took its rest;
And there it did both stop and stay
Right over the place where Jesus lay.

Then entered in those Wise Men three
Full reverently upon their knee,
And offered there in His presence
Their gold and myrrh and frankincense.
Nowell, Nowell, Nowell, Nowell,
Born is the King of Israel."]

The Wise Men did not return to Jerusalem to tell King Herod, for in a dream God told them not to do so, and they went back to their own country another way.

That same night, as Joseph slept, an angel from heaven appeared to him in a dream, and told him that the wicked King Herod was going to kill the Baby, and told him also to get up at once and hurry away to Egypt, where he would be quite safe from him. There was no time to lose, so Joseph got up and saddled his ass, and putting Mary and the Baby upon its back, the three set out upon their journey.

When Herod the king found that the Wise Men did not come back to tell him, he was so angry that he sent a band of his soldiers to Bethlehem, and ordered them to kill all the baby boys two years old and under in the town and the houses round about. Not a single boy child was to be spared, and they must take no notice of the mothers' cries.

Not long after this terrible deed King Herod himself died, and his son became king in his place. Once more an angel visited Joseph in a dream, and told him that he could now leave Egypt, for the wicked king was dead. Joseph at once set out with the Boy and His mother; but hearing that the new king was also very cruel, he went to a part of the country called Galilee and settled down in the little town of Nazareth.

AN ARTISTIC SERIES.

WE have already commended to the notice of our readers *The Scholar's Cartoons* published by Mr. Hanfstaengl, and illustrating great events and incidents of British national life. The series is printed in colour, and the pictures are reproduced from drawings by well-known eminent artists, for the decoration of the schoolroom as well as for class teaching. The pictures are, as might have been expected, highly artistic, and for wall decoration could not be surpassed or even equalled by anything we have seen designed for the purpose. In the matter of clearness and suitability for class instruction the plates can also be commended, as the colours are bright and the detail is uncrowded and distinct. We strongly advise all our readers to send for the latest prospectus of the series, which contains facsimile reproductions in full colour of six of the cartoons.

DIET IN INFANCY.

TEACHERS who are paying attention to housewifery and the care of young children will glean many valuable hints from a volume entitled *Diet in Infancy* by A. Dingwall-Fordyce, M.D., published by W. Green and Sons. A very useful syllabus of work on the Care of Infants could be drawn up from this book alone, especially for classes in our evening schools where courses in this all-important subject are now a regular feature of the prospectus. Dr. Fordyce deals ably and concisely with Normal Infancy, the Sick Child, Substitutes for Mother's Milk, and the Artificial Feeding of (1) the healthy and (2) the sick child, and sums up the latest and most approved ideas on Infant Food and Dietetics on lines somewhat similar to those of Dr. Hutchison, perhaps the greatest authority on these matters.

Our Query Column.

SOLUTIONS BY A. CLEMENT JONES, M.A., PH.D., SENIOR MATHEMATICAL MASTER, BRADFORD GRAMMAR SCHOOL.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

D'Arcy.—Prove that

$$1 - \frac{1}{7} + \frac{1}{9} - \frac{1}{15} + \frac{1}{17} - \ldots\ldots \text{ ad inf.}$$
$$= \frac{\pi}{8}(1 + \sqrt{2}).$$

We note that all the denominators are odd integers, that they occur in pairs of consecutive odd integers, and that two odd integers are omitted between each pair.

Now consider the series

$$S = x - \frac{x^7}{7} + \frac{x^9}{9} - \frac{x^{15}}{15} + \frac{x^{17}}{17} - \frac{x^{23}}{23} + \frac{x^{25}}{25} - \ldots.$$

Differentiate this

$$\frac{dS}{dx} = 1 - x^6 + x^8 - x^{14} + x^{16} - x^{22} + x^{24} - \ldots.$$
$$= (1 - x^6) + x^8(1 - x^6) + x^{16}(1 - x^6) + \ldots.$$
$$= (1 - x^6)(1 + x^8 + x^{16} + x^{24} + \ldots.)$$
$$= \frac{1 - x^6}{1 - x^8}.$$

The given series is the value of S between the limits $x = 1$ and $x = 0$ –that is, $S(x = 1) - S(x = 0)$ is the given series. Hence the given series is equal to

$$\int_0^1 \frac{1 - x^6}{1 - x^8}\,dx.$$

This can also be seen by expanding and integrating each term, but I have tried to show the way in which I arrived at the integral.

Now $$\frac{1 - x^6}{1 - x^8} = \frac{1 + x^2 + x^4}{(1 + x^2)(1 + x^4)} = \frac{1}{2}\left\{\frac{1}{1 + x^2} + \frac{1 + x^2}{1 + x^4}\right\},$$

then $$\int_0^1 \frac{1}{1 + x^2}\,dx = \Big[\tan^{-1} x\Big]_0^1 = \frac{\pi}{4}.$$

$$\int \frac{1 + x^2}{1 + x^4}\,dx = \int \frac{1 + x^2}{(1 - x^2)^2 + 2x^2}\,dx.$$

Put $$\frac{1 - x^2}{\sqrt{2}\,x} = \tan\theta;$$

that is, $$\frac{1}{x} - x = \sqrt{2}\tan\theta.$$

Differentiating, $$\left(-\frac{1}{x^2} - 1\right)dx = \sqrt{2}\,.\,\sec^2\theta\,.\,d\theta.$$

$$\therefore \int \frac{1 + x^2}{(1 - x^2)^2 + 2x^2}\,dx$$
$$= -\int \frac{1 + x^2}{2x^2(1 + \tan^2\theta)}\,.\,\frac{\sqrt{2}\sec^2\theta\,.\,d\theta}{1 + \frac{1}{x^2}}$$
$$= -\frac{1}{\sqrt{2}}\int d\theta.$$

But when $x = 0$, $\tan\theta = \infty$. $\therefore \theta = \frac{\pi}{2}$.

And when $x = 1$, $\tan\theta = 0$. $\therefore \theta = 0$.

Hence $$\int_0^1 \frac{1 + x^2}{1 + x^4}\,dx = -\frac{1}{\sqrt{2}}\int_{\frac{\pi}{2}}^0 d\theta = \frac{\pi}{2\sqrt{2}} = \frac{\pi\sqrt{2}}{4}.$$

Finally, $$\int_0^1 \frac{1 - x^6}{1 - x^8}\,dx = \frac{1}{2}\int_0^1 \frac{dx}{1 + x^2} + \frac{1}{2}\int_0^1 \frac{(1 + x^2)\,dx}{1 + x^4}$$
$$= \frac{1}{2}\,.\,\frac{\pi}{4} + \frac{1}{2}\,.\,\frac{\pi\sqrt{2}}{4}$$
$$= \frac{\pi}{8}(1 + \sqrt{2}).$$

Student.—Find the least parallelogram which can be drawn circumscribed to a given ellipse, and having one side along a given tangent. (B.Sc., London, 1906.)

First consider the case of a circle. Let AB be the given tangent, and in it take any point B.

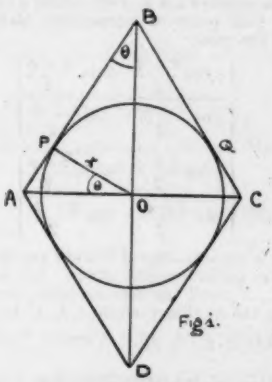


Fig 1.

From B draw a tangent BC to the circle, and by drawing parallel tangents to AB, BC, complete the circumscribing parallelogram ABCD.

Let O be the centre of the circle. Join OA, OB, OC, OD. Now, since AD, AB and BA, BC are pairs of tangents, OA bisects the angle BAD, and OB bisects the angle ABC.

Hence $\angle OBA + \angle OAB = \frac{1}{2}\{\angle DAB + \angle ABC\}$
$= \frac{1}{2}$ of 2 rt. $\angle$s, since BC . AD are parallel
$= 1$ right angle.

Hence $\angle AOB$ is a right angle.

Similarly, angles AOD, DOC, COB are right angles, and consequently AOC, BOD are straight lines—namely, the diagonals of the parallelogram ABCD. Hence the area of ABCD is equal to four times the area of the triangle OAB.

The area of this triangle
$= \frac{1}{2}\,.\,OA\,.\,OB$
$= \frac{1}{2}\,.\,r\sec\theta\,.\,r\,\mathrm{cosec}\,\theta$
$= \frac{r^2}{\sin 2\theta}$,

and is therefore least when $\sin 2\theta$ is greatest and equal to unity—that is, θ is 45°, and a square is the parallelogram of least area which can be described about a circle. In this case the diameters OP . OQ at whose extremities the tangents are drawn are at right angles.

Hence the least parallelogram which can be drawn circumscribed to a given ellipse, and having one side along a given tangent, has for its sides tangents at the ends of diameters parallel and perpendicular to the given tangent. These diameters are conjugate. We can apply this result

either geometrically or analytically to obtain the required parallelogram.

(i.) *Analytically.*—In Fig. 2 let the tangent at P be the

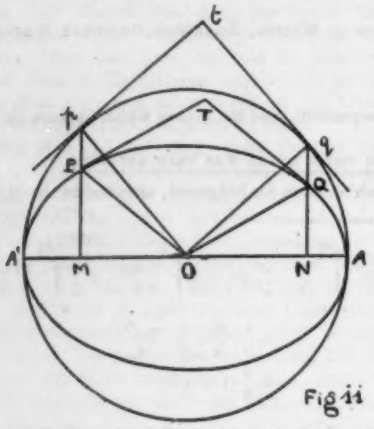


Fig 11

given tangent, and suppose TQ the adjacent side of the parallelogram. Draw $A'pA$, the auxiliary circle of the conic, and let p, q be the points on the auxiliary circle corresponding to P and Q.

If P is the point $(a\cos\theta, b\sin\theta)$ and Q $(a\cos\phi, b\sin\phi)$, then p is the point $(a\cos\theta, a\sin\theta)$ and q $(a\cos\phi, a\sin\phi)$. Further, T (the point of intersection of the tangents at P and Q) is the point

$$\left(\frac{a\cos\frac{\theta+\phi}{2}}{\cos\frac{\theta-\phi}{2}}, \frac{b\sin\frac{\theta+\phi}{2}}{\cos\frac{\theta-\phi}{2}}\right),$$

and t is

$$\left(\frac{a\cos\frac{\theta+\phi}{2}}{\cos\frac{\theta-\phi}{2}}, \frac{a\sin\frac{\theta+\phi}{2}}{\cos\frac{\theta-\phi}{2}}\right);$$

that is, the x co-ordinates of T and t are the same, and the y co-ordinates are in the ratio of $b:a$. Let the parallelogram be T, T_1, T_2, T_3 and the corresponding parallelogram circumscribing the auxiliary circle t, t_1, t_2, t_3. Then if T, T_1 are the points $(x, y)(x_1, y_1)$, t, t_1 are $(x, \frac{a}{b}y)$ $(x_1, \frac{a}{b}y_1)$, hence the areas TOT_1, tot_1 are respectively $(xy_1 - x_1y)$ and $\frac{a}{b}(xy_1 - x_1y)$—that is, are in the ratio $b:a$, which is fixed. It follows immediately that the parallelogram T, T_1, T_2, T_3 is $\frac{b}{a}$ times the parallelogram t, t_1, t_2, t_3. Hence both parallelograms are a minimum together. But the minimum parallelogram circumscribing a circle is a square—that is, $\angle pTq$ is a right angle as shown in the figure. Hence $\angle pOq$ is also a right angle—that is, the eccentric angles qOQ and pOQ of the points PQ differ by a right angle—that is, OP, OQ are conjugate diameters. Hence the parallelogram of minimum area circumscribed to an ellipse, and having one side along a given tangent at a point P, has its sides adjacent to this parallel to OP.

(ii.) *Geometrically.*—If we project Fig. 1 orthogonally the circle becomes an ellipse. Now diameters at right angles in a circle project orthogonally into conjugate diameters, for the conjugate property is projective. But the parallelogram of minimum area in the case of a circle has its sides tangents at the ends of diameters at right angles—that is, conjugate diameters of the circle. Hence in the ellipse the circumscribing parallelogram of least area has its sides tangents at the ends of conjugate diameters.

The method shown in (i.) is of general use in analytics when dealing with maxima or minima triangles, etc., in relation to the ellipse. Method (ii.) was probably intended if the question occurred in a pure geometry paper.

J. W. Proctor.—A butler has a 20-gallon cask full of rum. He takes out one gallon each week, and fills up with water. This he does for 20 weeks. He then puts in one gallon of rum for every gallon of the mixture he takes out each week for 20 weeks.

What will there be left in the cask at the end of the 40 weeks?

We note that after each operation the total quantity of liquid is 20 gallons. To deal with the first 20 weeks: after any one week, suppose the cask contains x gallons of rum, and consequently $20 - x$ gallons of water, then in any gallon of the mixture $\frac{x}{20}$ths are rum, and $\frac{20-x}{20}$ths are water. When this gallon is removed, the amount of rum left is $x - \frac{x}{20} = \frac{19}{20}x$ gallons; and when the gallon of water is added, since all the rest is water, the barrel contains $\left(20 - \frac{19}{20}x\right)$ gallons of water.

We see then that the rum decreases in the ratio $\frac{19}{20}$ at each operation. We start with 20 gallons of rum. After the first week $\frac{19}{20} \times 20$ gallons are left. After the second week $\frac{19}{20} \times \frac{19}{20} \times 20$ gallons, and so on.

Hence after the first twenty weeks the cask contains $\left(\frac{19}{20}\right)^{20} \times 20$ gallons of rum, and consequently $20\left[1 - \left(\frac{19}{20}\right)^{20}\right]$ gallons of water.

Similarly in the second case, where rum is added to fill the barrel, the water is reduced in the ratio $\frac{19}{20}$ at each operation. Hence the amount of water left at the end of the 40 weeks is

$$\left(\frac{19}{20}\right)^{20}\left[1 - \left(\frac{19}{20}\right)^{20}\right] . 20 \text{ gallons};$$

and the rest of the 20 gallons is rum. The answer is approximately 15·4 gallons of rum and 4·6 gallons of water.

W. Gorton.—If $u = \log(\tan x + \tan y)$ show that

$$\sin 2x\frac{du}{dx} + \sin 2y\frac{du}{dy} = 2.$$

This follows at once from the partial differentials of u.

Thus $\frac{du}{dx} = \frac{\sec^2 x}{\tan x + \tan y}$ and $\frac{du}{dy} = \frac{\sec^2 y}{\tan x + \tan y}$.

Thus $\sin 2x\frac{du}{dx} = \frac{2\sin x \cdot \cos x \cdot \sec^2 x}{\tan x + \tan y} = \frac{2\tan x}{\tan x + \tan y}$;

and, similarly, $\sin 2y\frac{du}{dy} = \frac{2\tan y}{\tan x + \tan y}$.

Hence $\sin 2x\frac{du}{dx} + \sin 2y\frac{du}{dy} = \frac{2\tan x + 2\tan y}{\tan x + \tan y} = 2.$

Provoh.—If $p = x\cos\alpha + y\sin\alpha$, touch the curve

$$\frac{x^m}{a^m} + \frac{y^m}{b^m} = 1,$$

prove that $p^{\frac{m}{m-1}} = (a\cos\alpha)^{\frac{m}{m-1}} + (b\sin\alpha)^{\frac{m}{m-1}}$.

Hence write down the polar equation of the locus of the foot of the perpendiculars from the origin on the tangent to this curve. Examine the cases of an ellipse and of a rectangular hyperbola.

Suppose (x_1, y_1) is the point of contact, then (x_1, y_1) satisfies both

$$p = x\cos\alpha + y\sin\alpha,$$

and

$$\frac{x^m}{a^m} + \frac{y^m}{b^m} = 1,$$

and also the direction of the line and curve at this point are the same—that is, the values of $\frac{dy}{dx}$ derived from each equation are equal when $x = x_1$ and $y = y_1$.

These values of $\frac{dy}{dx}$ are $-\cot\alpha$ and $-\frac{b^m}{a^m}, \frac{x^{m-1}}{y^{m-1}}$;

and consequently we have

$$p = x_1\cos\alpha + y_1\sin\alpha, \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(i.)}$$

$$\frac{x_1^m}{a^m} + \frac{y_1^m}{b^m} = 1, \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(ii.)}$$

$$\frac{b^m x_1^{m-1}}{a^m y_1^{m-1}} = \cot\alpha. \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(iii.)}$$

From the last equation

$$\frac{\cos\alpha}{\frac{x_1^{m-1}}{a^m}} = \frac{\sin\alpha}{\frac{y_1^{m-1}}{b^m}} = \frac{x_1\cos\alpha + y_1\sin\alpha}{\frac{x_1^m}{a^m} + \frac{y_1^m}{b^m}} = p$$

by substitution from (i) and (ii).

Hence $$x_1 = a^{\frac{m}{m-1}}\left(\frac{\cos\alpha}{p}\right)^{\frac{1}{m-1}}.$$

$$y_1 = b^{\frac{m}{m-1}}\left(\frac{\sin\alpha}{p}\right)^{\frac{1}{m-1}};$$

and substituting these values in (ii.)

$$\frac{a^{\frac{m^2}{m-1}}}{a^m}\left(\frac{\cos\alpha}{p}\right)^{\frac{m}{m-1}} + \frac{b^{\frac{m^2}{m-1}}}{b^m}\left(\frac{\sin\alpha}{p}\right)^{\frac{m}{m-1}} = 1,$$

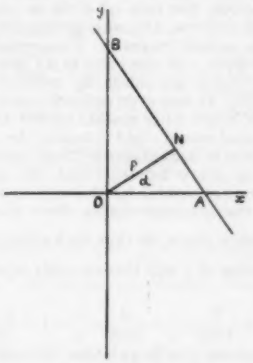
which at once reduces to

$$p^{\frac{m}{m-1}} = (a\cos\alpha)^{\frac{m}{m-1}} + (b\sin\alpha)^{\frac{m}{m-1}}.$$

If AB in the figure is the straight line whose equation is

$$x\cos\alpha + y\sin\alpha = p,$$

then p is the length of the perpendicular ON from the origin on AB, and α is the angle this perpendicular makes



with the axis of x. Hence if Ox is taken as the initial line, the polar co-ordinates of N are (p, α). Hence the polar equation of the locus of N is

$$r^{\frac{m}{m-1}} = (a\cos\theta)^{\frac{m}{m-1}} + (b\sin\theta)^{\frac{m}{m-1}}.$$

(a) In the case of an ellipse m is 2 since the given curve is then $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, and the locus becomes

$$r^2 = a^2\cos^2\theta + b^2\sin^2\theta.$$

This is a curve of the fourth degree touching the ellipse at the ends of the major and minor axes, and lying outside the ellipse. It resembles an ellipse pressed inwards at the ends of the minor axis.

(b) For a rectangular hyperbola $m = 2$, and also $b^2 = -a^2$, the given curve being $x^2 - y^2 = a^2$, and the locus $r^2 = a^2\cos 2\theta$.

This is a curve touching the hyperbola at the ends of the axis. There is a node at the origin, the tangents being $x - y = 0$ and $x + y = 0$. Thus the curve resembles the figure 8.

François.—Show how, by the intersection of two loci, to find the values of θ and ϕ which satisfy the equations

$$3\cot\theta - 5\cot\phi = 1{\cdot}5,$$
$$3\sin\theta - 2\sin\phi = 0.$$

The second equation gives us

$$3\operatorname{cosec}\phi = 2\operatorname{cosec}\theta.$$

Square each side, hence

$$9 + 9\cot^2\phi = 4 + \cot^2\theta$$

—that is,

$$4\cot^2\theta - 9\cot^2\phi = 5.$$

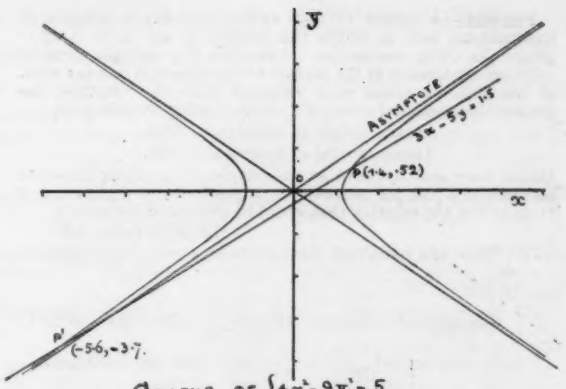
Now put $x = \cot\theta$ and $y = \cot\phi$, and we have

$$4x^2 - 9y^2 = 5, \quad \ldots\ldots\ldots \text{(i.)}$$

and

$$3x - 5y = 1{\cdot}5. \quad \ldots\ldots\ldots \text{(ii.)}$$

But the graph of (i.) is a hyperbola, centre the origin,



GRAPHS OF $\begin{cases} 4x^2 - 9y^2 = 5 \\ 3x - 5y = 1{\cdot}5 \end{cases}$

asymptotes $2x - 3y = 0$, $2x + 3y = 0$, and where major semi-axis is $\frac{\sqrt{5}}{2}$.

Since $y = \frac{1}{3}\sqrt{4x^2 - 5}$, we can get the following points in the first quadrant immediately,

x	1·5	2	3	4	5	6
y	·66	1·1	1·85	2·56	3·24	3·96

the curve in the other quadrant being symmetrical with this.

Also the graph of (ii.) is a straight line. The graphs of (i.) and (ii.) intersect in two points, P, P', which within the accuracy of our drawing are (1·4, ·52) (- 5·6, - 3·7). The values found algebraically by solving these equations are

$$x = 1{\cdot}36, \quad y = {\cdot}516,$$

and

$$x = -5{\cdot}61, \; y = -3{\cdot}67.$$

This gives us therefore as simultaneous values satisfying the equations

$$\cot\theta = 1{\cdot}36, \; \cot\phi = {\cdot}516;$$

whence

$$\theta = 180m + 36^\circ\,20',$$
$$\phi = 180n + 62^\circ\,40',$$

and similarly from the other pair.

Any pair of values of θ and ϕ obtained by giving integral values to m and n give a solution, provided the angles are both in either the first or second quadrant, *or* are both in either the third or fourth quadrant. This restriction is necessary since the second equation

$$3\sin\theta = 2\sin\phi$$

shows that $\sin\theta$ and $\sin\phi$ have the same sign. This restriction was lost when we squared each side of the equation in the process of solution.

Senor Dal.—Show that the kinetic energy of a system of particles is equal to $\frac{1}{2}MV^2 + \frac{1}{2}\Sigma mv^2$, where M is the sum of the masses, V the velocity of the centre of gravity, and v the velocity of the mass m relative to the centre of gravity.

(R.U.I., B.A., 1909.)

Refer the system to two axes at right angles fixed relative to the earth, and let the velocities of any particle m_1 relative to these axes and resolved along them be x_1 and y_1.

The components of the velocity of the centre of gravity relative to these axes are therefore

$$X = \frac{\Sigma mx}{M} \text{ and } Y = \frac{\Sigma my}{M},$$

and by hypothesis $X^2 + Y^2 = V^2$.

Now the resolved parts of the velocity of m_1 referred to, parallel axes through the centre of gravity, are

$$x - X \text{ and } y - Y.$$

Hence

$$v^2 = (x - X)^2 + (y - Y)^2$$
$$= x^2 + y^2 + X^2 + Y^2 - 2xX - 2yY,$$

or

$$x^2 + y^2 = v^2 + 2xX + 2yY - V^2.$$

The kinetic energy of the system is

$$\tfrac{1}{2}\Sigma m(x^2 + y^2) = \tfrac{1}{2}\Sigma mv^2 + X\Sigma mx + Y\Sigma my - \tfrac{1}{2}MV^2$$
$$= \tfrac{1}{2}\Sigma mv^2 + MX^2 + MY^2 - \tfrac{1}{2}MV^2$$
$$= \tfrac{1}{2}\Sigma mv^2 + \tfrac{1}{2}MV^2.$$

Physics.—A sphere of unit radius contains a solution of hydrochloric acid in which the density of the acid is 10^{-4} grams per cubic centimetre. Calculate the electric force in volts per centimetre at the surface of the sphere, if one per cent. of the chlorine atoms were removed from the solution, the electro-chemical equivalent of hydrogen being ·000104 gram.

Atomic weight of chlorine = 35·5.

Atomic weight of hydrogen = 1·01.

Hence show that it would be impossible, by applying forces of an order of a volt per centimetre, to produce any separation of H and Cl in the solution that could be estimated chemically.

(London B.Sc., 1907.)

Since the radius of the sphere is 1 cm., the volume is $\frac{4\pi}{3}$ c.c.

The solution therefore contains $\frac{4\pi}{3} \times 10^{-4}$ gms. of HCl.

Of this amount $\frac{1\cdot01}{36\cdot51} \times \frac{4\pi}{3} \times 10^{-4}$ gms. are hydrogen.

The free hydrogen, being one per cent. of this, is

$$\frac{1\cdot01}{36\cdot51} \times \frac{4\pi}{3} \times 10^{-6} \text{ gms.}$$

Now we are given that 104×10^{-6} grams of H are released by 1 coulomb.

Hence $\frac{1\cdot01}{36\cdot51} \times \frac{4\pi}{3} \times 10^{-6}$ grams of H are released by $\frac{4\pi}{3} \times \frac{1\cdot01}{36\cdot51 \times 104}$ coulombs.

The capacity of the sphere = 1 C.G.S. unit.

$= 10^{-9}$ farads.

Hence, since the capacity is the quantity of electricity per unit potential, the potential of the sphere

$$= \frac{4\pi}{3} \times \frac{1\cdot01}{104 \times 36\cdot51} \times 10^9 \text{ volts.}$$

Now the surface of the sphere is 4π square centimetres, hence the volts per square centimetre

$$= \frac{1\cdot01 \times 10^9}{3 \times 104 \times 36\cdot51} = 6\cdot58 \times 10^4.$$

Now $6\cdot58 \times 10^4$ volts per square centimetre correspond to $\frac{4}{3}\pi \times \frac{1\cdot01}{36\cdot51} \times 10^{-6} = \cdot116 \times 10^{-6}$ grams of hydrogen.

Hence 1 volt per square centimetre corresponds to

$$\frac{\cdot116 \times 10^{-6}}{6\cdot58 \times 10^4} = 1\cdot7 \times 10^{-11} \text{ gms.,}$$

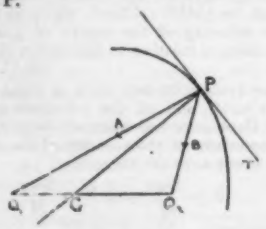
which could not be estimated chemically.

G.P.—The equation of a Cartesian oval is

$$Ar_1 + Br_2 = 1,$$

where r_1 and r_2 are the distances of P from two fixed points Q_1 and Q_2. If forces proportional to A and B act along PQ_1 and PQ_2, prove that their resultant acts along the normal to the curve. (R.U.I., B.A., 1909.)

In the figure let PT be the tangent and PG the normal to the curve at P.



Now $Ar_1 + Br_2 = 1.$

Hence $A\frac{dr_1}{ds} + B\frac{dr_2}{ds} = 0.$

But $\frac{dr_1}{ds} = \cos TPQ_1$, and $\frac{dr_2}{ds} = \cos TPQ_2$;

that is, $A \cos TPQ_1 + B \cos TPQ_2 = 0.$

Hence the sum of the resolved parts of two forces A and B (acting along PQ_1 and PQ_2), in the direction PT, is zero.

It follows that the resultant of these two forces is perpendicular to PT—that is, acts along the normal PG.

Alpha.—Assuming that an infinite series can be dealt with as a finite series, show from the Binomial Theorem that

$$\underset{n=\infty}{\mathrm{L}}\left(1 + \frac{x}{n}\right)^n = e^x,$$

where $e = 1 + 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \ldots$ *ad inf.*

If the instantaneous birth and death rates be b and d per thousand per year, show that a population of Q millions becomes $Qe^{\frac{b-d}{1000}t}$ millions at the end of t years.

(Inter. Sci. Econ., 1908.)

The first part of this question is done in the book work on logarithms in any text-book on algebra. (Hall and Knight, § 220.)

The difference between the *instantaneous* birthrate and the usual statement that the number of births per thousand of the population is so many in the year is simply one of time interval. Birth and death rates are usually estimated monthly; and the birth figures for the month, if given as x per thousand per year, mean that if the population at the beginning of the month is 1,000, the number of births during the month is $\frac{x}{12}$. In this case our time interval is a month; but in the theoretical case where the instantaneous birth-rate is given, the time interval is supposed to be very small. In other words, the rate of birth is supposed to be continuous and uniform, the rate giving the same total for the year as the actual increase. Compound interest offers a similar example. If the rate is £1 per cent. per annum, then, if accounts are made up annually, each year £100 becomes £101. If, however, accounts were made up monthly, each month every £100 would become £100$\frac{1}{12}$, and the increased capital would yield interest the second month. If the rate given is instantaneous, then theoretically accounts are made up every moment, and the interest earned one moment becomes capital for the next moment.

Now in the question divide the t years up into a very large number n parts, so that each small part is $\frac{t}{n}$ years.

A population of 1 will theoretically become in the interval $\frac{t}{n}$ years.

$$1 + \frac{b}{1000} \cdot \frac{t}{n} - \frac{d}{1000} \cdot \frac{t}{n} = 1 + \frac{b-d}{1000} \cdot \frac{t}{n}.$$

Every unit in this population becomes during the next interval of $\frac{t}{n}$ years in a similar manner $1 + \frac{b-d}{1000} \cdot \frac{t}{n}$; that is, at the end of the second interval the population is $\left(1 + \frac{b-d}{1000} \cdot \frac{t}{n}\right)^2$, and so on.

Thus in t years unit population becomes

$$\left(1 + \frac{b-d}{1000} \cdot \frac{t}{n}\right)^n = e^{\frac{b-d}{1000}t},$$

when n is taken infinitely large and our intervals therefore infinitely small. Hence Q millions become

$$Qe^{\frac{b-d}{1000}t} \text{ millions.}$$

Mechanics.—Garnett's *Dynamics* or Loney's *Treatise on Dynamics* are about the standard you ask for, and both contain many worked out examples. In statics Greave's book contains a maximum of illustrative examples. A more elementary work by the Query Column Editor also contains a large selection of worked out examples.

SPECIAL NOTICE.

THE Editor has pleasure in announcing that he has made arrangements with

MR. A. R. PICKLES, M.A.,

to provide

A Complete Scheme of Constructive Work

in which Hand and Eye Training is combined with the ordinary school subjects where possible, and which includes Practical Drawing, Paper and Cardboard Modelling, and calculations in Arithmetic, Algebra, and Mensuration based upon the handwork.

The articles will commence in the *February issue of this Journal.*

A SCHEME OF CORRELATED HISTORY AND LITERATURE.

THE DANISH INVASION.

BY MABEL A. BROWN.

GRADE I.—STANDARDS I. AND II.	GRADE II.—STANDARDS III. AND IV.	GRADE III.—STANDARDS V., VI., AND VII.
History—		
1. The Vikings—their homes, manners, appearance, their religious beliefs, etc.	1. As for Grade I., in greater detail.	1. As for Grade I., in greater detail. Use maps of England and Europe.
2. The coming of the Danes to England; their plunder raids and the terrorising effect upon the English. (See chap. i. in *Stories from the Life of Alfred*. E. J. Arnold, 5d.)	2. 787–855. The first Danish invasion; ravaging of Wareham, Jarrow, and Wearmouth. Battle of Hengestdown under Egbert.	2. and 3. As for Grade II. Mark course of settlement on blank maps for this section and the next, marking plundering raids in black and settlements in red. Map for Treaty of Wedmore. Use "Britannia" Historical Geography Books (Charles and Dible, 3s. per doz.). Use also "Suggestions" Drawing Cards by the same firm, Set A, 1s. 6d.
3. The settlement of the Danes. Boyhood of Alfred.	3. 855–876. The settlement of the Danes — story of Guthrum, the Treaty of Wedmore, the Danelagh.	
4. King Alfred and the Danes; the Treaty of Wedmore; Alfred's good deeds.	4. Story of Alfred — boyhood, wars, character, reforms.	4. Biography of Alfred the Great—special attention to reforms.
Literature—		
To be told to the Children.	*To be read by the Children.*	*To be read by the Children.*
Havelock the Dane. King Guthrum and his vow. King Eric and the poet Egil. } *Old Stories from British History* (Longmans, Green, 1s.). King Alfred and the Danes, from *Boys and Girls of Other Days* (A. and C. Black, 1s. 4d.).	*Stories from the Life of King Alfred* (E J. Arnold, 5d.). *King Horn* (Books for Bairns, 1d.). *Children of Odin* (Horace Marshall, 1s.).	*Gisli the Outlaw*, or *Tales of Early England*, or *Tales from the Eddas.* } (George Harrap, 9d. each). *Stories from the Northern Sagas* (Horace Marshall, 2s. 3d.).
Recitation—		
The Saga of King Olaf, Part XVIII. (Longfellow.) Selected lines from poems mentioned below.	King Christian, or parts of The Voyage of Othere. } (Longfellow.)	Tegner's Drapa (Baldur the Beautiful)—Longfellow, or Alfred's Map, from *Poems of English History* (A. and C. Black, 1s. 6d.).

NOTES ON LITERATURE AND TEACHER'S READING.

The period of the Danish invasion will occupy two months—January and February. The literature suggested will do for either or both months. Teachers should read in this connection Scandinavian mythology in Carlyle's *Heroes and Hero Worship;* Longfellow's *Discoverer of the North Cape, Saga of King Olaf, Skeleton in Armour, To an Old Danish Song Book;* Mackay's *Sea-King's Burial;* Matthew Arnold's *Baldur; Northern Sagas*, published by Horace Marshall. It would be specially advisable to read passages from the poems aloud to the older children.

Books on Special History.—The best books on this period are rather expensive, but the following are good, and contain all that is necessary for the teaching of children under fifteen: *The Making of the English Nation* (Blackie, 1s.), *A First History of England*, 1s.; *Illustrative History I.*, 2s. 6d. (Horace Marshall); *Old Stories from British History*, 1s.; and *Alfred the Great*, 8d. (Longmans Green).

NOTES ON HISTORY.

Description of Danes.—Not only from Denmark, but Norway, Jutland, and Sweden. Causes were a superabundant population, and a passion for plunder. Leaders were not kings but captains—warriors chosen for their superior skill, strength, and courage. Called Vikings, from the wicks or creeks where their homes lay, and from which they set out. In religion, social life, custom, etc., they were closely allied to the Saxon invaders. Their ravages were not confined to England, but bands sailed up the Seine and Loire, and descended upon the coasts of Ireland and Scotland. The Danes were a brave and cruel people, eager for battle and plunder, disdainful of death. They gave no quarter, but relentlessly slaughtered, burned, and pillaged everywhere they went. The English were terrified when they saw the long ships of their fierce enemies off their coasts, and fled from their homes, taking refuge in the woods. The monasteries suffered terribly, for the Danes were heathen, and had no respect for the Christian religion. Their one idea was that the monasteries were rich in gold and silver, precious MSS., and other valuables. Every monastery in their path was sacked. The ships themselves were of a terrifying aspect, with an enormous figure-head of a dragon or other fierce animal. Their standards, too, were in the form of ravens, eagles, serpents, dragons, bears, or wolves. The national flag was called the raven, and it is said that it was woven in one day by the three sisters of Hubba. There was also a story that if the Danes were to be victorious in a battle, a live crow would appear in the middle of the flag which flew out to the breeze. Read prelude to *Hereward the Wake* for interesting and vivid account of the period between Saxon and Norman conquests, also chapter ii. of Lytton's *Harold*.

The Danish Invasion.—Divided by Professor Freeman into three periods—(1) Plunder, (2) settlement, (3) conquest.

Period I.—The period of plundering raids started about 787, when three Danish ships appeared off Wareham in Dorset. Strange, fierce men landed, pillaged and harried the district, then returned to their ships with their booty, and set sail. From this time numerous

parties of Danes descended on the English coast in this way, bringing havoc and destruction in their train. Soon they came every year. Large sums of money were often paid to buy them off; but this was a fatal mistake, as it only encouraged their incursions. Kings Egbert, Athelstan, Ethelwulf, and Ethelbert all fought against the Danish invaders. One year they sailed up the Thames with a fleet of three hundred vessels, and entered London. The year 855 is an important one, for now for the first time they wintered in England. This marks the transition period, and leads to the time when the Danes began to settle in England. The effect of these invasions on the people of this country was consolidation, as they united against a common enemy.

Period II.—In the reign of Ethelred the invasions assumed a more terrible aspect. There was a great struggle in 867 against Hubba, who landed with his brother and a great army to avenge the death of his father. York and Nottingham fell to the invaders. Ethelred and Alfred assisted the King of Mercia in driving them back temporarily; but nothing could permanently curb them, and in 870 they rallied under Guthrum, and made East Anglia a Danish kingdom, barbarously murdering King Edward, who refused to abjure Christianity. Churches and monasteries were burnt down, and the eastern and midland districts laid bare and desolate. From East Anglia they sallied forth into Wessex, and here was made the most stubborn, desperate resistance under Alfred the Great. Nine battles were fought round Reading, the most important being Ashdown in 871, in which there was great slaughter. Asser says, "The Danes were fighting for victory, the English for life, their loved ones, and their country." The existence of Wessex was now at stake, and on the fate of Wessex hung the fortunes of all England. At the battle of Merton in Surrey Ethelred was killed, and the crown fell to Alfred.

Reign of Alfred.—871–901. Born at Wantage 849.

Boyhood.—Stories of Alfred's boyhood; tutor, St. Swithin. In 853, went to Rome; stayed for three years until his father brought him back. It was on this return journey that King Ethelwulf married Judith, the daughter of the Emperor Charles, through whose encouragement Alfred learned to read. Early education—learning to repeat parts of the Bible, religious poems and songs of the minstrels; learned to sing these songs and to play upon the harp. Taught the use of arms and to be brave, hunting, and the sports and games of the day.

Wars.—Even before he came to the throne his fights with the Danes commenced. He helped his brother Ethelred in his wars at the age of nineteen. The greater part of his reign was taken up with these wars. Peace was sometimes concluded, but the Danes' promises could not be relied upon, and war frequently broke out. Tell stories of Guthrum, Alfred's hiding at Athelney, battles of Ethandune, and the concluding of the Treaty of Wedmore.

Good Deeds.—Alfred, the only king called *the Great*, perhaps the greatest king of all time, also called the Truth Teller, England's Darling, England's Comfort, the Father of the Navy. From these titles we can learn a good deal of his character and the character of his reign. Alfred gave the best of his attention to five things—(1) law, (2) justice, (3) religion, (4) education, (5) home defence.

1. Asser, a Welsh monk whom Alfred called to his court because of his learning, tells us a great deal of the king's efforts to gather, reform, and reconstruct the best of the existing laws. He drew up this code of laws himself, putting first the ten Commandments, a few chapters from the Bible, and the precept, "Whatsoever ye would that men should do to you, even so do ye to them," thus showing how strong a religious sense he had, and how he felt that the law of God must be the basis for all effectual human laws. Then followed the laws for regulating the life of the people and preserving peace, order, and prosperity. Give examples of Anglo-Saxon laws.

2. *Justice.*—Alfred chose his judges with great care, and often went into a case himself in order to see if justice had been done. Injustice was punished by deprivation of offices.

3. *Religion.*—We have already had proof of the deep religious sense of the king. He was very devout, and built many churches, rebuilt monasteries, saw that the clergy did their duty, and encouraged all men by the beauty of his own life. He realised that the monasteries must be at that period the sanctuaries and strongholds of learning, and the centre of all religious teaching.

4. *Education.*—No king has ever been more zealous for the cause of learning than Alfred. He was himself a writer, and translated several books into the Saxon language. These were Orosius's *History of the World*, to which he added the story of Othere's voyage, *The Consolations of Boethius*, and Bede's *History of the English Church*. He also ordered the *Old English Chronicle* to be translated into English. He built schools, sent abroad for good teachers, and it was his wish that every freeborn boy should "abide at his work until he can well understand English writing."

5. *Home Defence.*—Alfred built a fleet of boats, larger, stronger, and swifter than those of the Danes, realising that if England wants to be safe from her enemies she must have a fleet. He also built forts, and rebuilt several towns and their fortifications which were in ruins. He also divided the fighting men, so as to have one part always ready for warfare, while the other part looked after the land. Alfred loved peace; but realising that in his own generation at least it could only be won through arduous and prolonged warfare, he became a great warrior in the cause of home defence.

Alfred died in 901, leaving the record of what has been called "the most perfect character in history."

Notes on Pictures.

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Our Readers' Column.

STUDIES OF BOOKS THAT ARE WORTH WHILE.

BY SUSAN CUNNINGTON.

VIII.—English Songs and Lyrics.

THE most ancient collection of songs and lyrics known to the ordinary reader is the Book of Psalms. Although they are the work of various poets in different ages, they have come down to us with a title which, in accordance with Eastern custom, attributes them to the most distinguished contributor. Somewhat similar, in modest reticence as to authorship, were the Elizabethan collections of poems by the many poets who made England then "a nest of singing birds." Many volumes were published, and it is believed that even more existed in manuscript form, and all were delightedly studied, discussed, and appreciated in the cultivated society of the day. For it was part of a gentleman's education to be able to compose verse, and an essential accomplishment to know how to criticise and admire similar compositions.

Some of the curious titles of these books of verse have been handed down, and they reveal the mingled affectation and sincerity, the sentimentality and the genuine feeling, which characterised them. Amongst the more famous were *The Paradise of Dainty Devices*, *A Gorgeous Gallery of Gallant Inventions*, *The Phœnix' Nest*, and *A Handful of Pleasant Delights*. Here and there our modern anthologies preserve something of the old fancifulness of naming, as in Palgrave's *Golden Treasury*, Beeching's *Paradise of English Poetry*, and Mrs. Meynell's *The Flower of the Mind*.

Many of the songs and lyrics in these collections are known and familiar because their melodious phrases and just epithets have become part of our common thought and speech, and are continually being quoted unawares. This is especially true of the songs and ballads which have been set to music and sung; but there are many instances in the unsung poems where the felicity of expression or the simple truth of the sentiment has led to its being generally known and quoted.

With such a collection as any one of those named before us, we see that there are two principal divisions of songs and three principal divisions of lyrics. The former contains the narrative in verse, usually now understood as the ballad; and the poetical treatment of some idea or circumstance, which constitutes the song without narrative. The ballad is the lineal descendant of the ancient literary form which preceded even the primitive drama. It will be remembered that old ballad music is not distinguished by any wide range of melody. The declamation, in a kind of recitative, was enlivened by the two devices of rhythmic movements and gestures, and the introduction of a refrain or "burden." These are admirably preserved in some forms of the Christmas carol, notably in "I saw Three Ships come Sailing in," and in a very successful imitation of traditional carols by that master of the archaic, William Morris, entitled "From Far Away."

"From far away we come to you,
[The snow in the street and the wind on the door,]
To tell of great tidings strange and true.
[Minstrels and maids stand forth on the floor,
Stand forth on the floor."]

The anouncement then forms the chorus through a succession of eight verses, in which the narrative slowly progresses, being at once delayed and enlivened by the interrupting "burden."

"For as we wandered far and wide,
[The snow in the street and the wind on the door,]
What hap do you deem there should us betide?
[Minstrels and maids stand forth on the floor—
Stand forth on the floor.]
From far away, etc.

"Under a bent when the night was deep,
[The snow in the street and the wind on the door,]
There lay three shepherds tending their sheep.
[Minstrels and maids stand forth on the floor—
Stand forth on the floor.]
From far away, etc."

Amongst English ballads which were known everywhere in the pre-reading days of modern England are Gay's "Black-eyed Susan," with its special appeal to an island nation of seafarers; Carey's "Sally in our Alley;" Lady Lindsay's "Auld Robin Gray;" and Burns's inimitable Scottish ballads, "Ye Banks and Braes o' Bonnie Doon," "Bonnie Lesley," and "John Anderson."

Of the songs without narrative, melodious expressions of feeling upon some episode or circumstance or idea, Shakespeare's stand supreme in the quality of tuneful happiness. His fairy songs, love songs, tiny pastorals, and slender dirges have in them a lilt of irresponsible, uncalculating light-heartedness that later ages in vain seek to reproduce. Next in order of time and development are the metaphysical and mystical songs of love and piety which we connect with the names of Herrick, Herbert, and John Donne. The muse of Herrick was especially happy in the brief fragmentary expression of some floating idea, as in his "Hymn to Love"—

"I will confess
With cheerfulness
Love is a thing so likes me,
That, let her lay
On me all day,
I'll kiss the hand that strikes me."

and his apostrophe "To Music"—

"Music, thou queen of heaven, care-charming spell
That strik'st a stillness into hell;
Thou that tam'st tigers and fierce storms that rise,
With thy soul-melting lullabies;
Fall down, down, down, from those thy chiming spheres
To charm our souls, as thou enchant'st our ears."

The sacred songs of George Herbert are unique in their combination of fervent ardour of spirit and curious conceits of method and form. His "Christmas" is an example:—

"The shepherds sing, and shall I silent be?
My God, no hymn for Thee?
My soul's a shepherd too; a flock it feeds
Of thoughts and words and deeds.
The pasture is Thy word; the streams Thy grace,
Enriching all the place.

Shepherd and flock shall sing, and all my powers
Out-sing the daylight hours.
Then will we chide the sun for letting night
Take up his place and right."

The cultivated taste of the England of the early Stuart kings revelled in poetical abstractions, in delicate analogies, and in paradoxical subtleties of thought and expression. Of this school of poetry Dr. John Donne was leader and chief ornament; and his "Present in Absence" is a happy and not too difficult illustration of his style, beginning—

"Absence, hear thou this protestation
Against thy strength,
Distance, and length;
Do what thou canst for alteration;
For hearts of truest mettle
Absence doth join, and Time doth settle."

Before drifting away from the song proper, which, with the mystical and metaphysical poets, it is easy to do, we should notice the triumphant example in Milton's "Ode on the Morning of Christ's Nativity." After the introductory stanzas comes "The Hymn," with its mingling of classical and pagan lore, and its marshalling of images and aspirations:—

"Ring out, ye crystal spheres!
Once bless our human ears,
If ye have power to touch our senses so;
And let your silver chime
Move in melodious time;
And let the bass of heaven's deep organ blow,
And with your ninefold harmony
Make up full consort to the angelic symphony."

The period between Milton and Wordsworth saw a great development of lyrical poetry, but with an increase of the reflective quality, and a more than corresponding decrease of "song." It has been said that Old English lyrical verse was almost entirely elegiac, the note always one of lamentation for vanished days or departed pleasures; so that it is not surprising to find that elegies are largely represented in any collection of English lyrics.

The seventeenth century produced some examples of the reflective lyric, the quiet meditative flow of thought which hardly lends itself to song. Indeed, much of Herbert's verse and that of Donne may be so described. One of the most beautiful and least known is by a spiritual successor of Herbert, John Norris of Bemerton. His "Hymn to Darkness" is a suggestive antidote to the horror inculcated by Milton, and seems to anticipate the modern question as to whether darkness is an entity or a negation. One stanza may well be studied beside Milton's impressive description in Book II. of *Paradise Lost*:—

"Before great Love this monument did raise,
This ample theatre of praise;
Before the folding circles of the sky
Were tuned by Him, who is all harmony;
Before the morning stars their hymn began,
Before the council held for man,
Before the birth of either time or place,
Thou reign'st unquestioned monarch in the empty space."

Henry Vaughan, a contemporary of Norris, is even more mystical, and in "A Vision" conveys a suggestion of immensity not often grasped:—

"I saw eternity the other night,
Like a great ring of pure and endless light,
All calm, as it was bright.
And round beneath it Time, in hours, days, years,
Driven by the spheres,
Like a vast shadow moved; in which the world
And all her train were hurl'd."

His "The Retreat" is a less philosophical treatment of the theme of Wordsworth's "Ode on the Intimations of Immortality." A lovely little lyric by Habington paraphrases the opening of the 19th Psalm with the title "Night unto Night revealeth Knowledge."

"When I survey the bright
Celestial sphere,
So rich with jewels hung, that night
Doth like an Ethiop bride appear,

"My soul her wings doth spread,
And heavenward flies,
The Almighty's mysteries to read
In the large volumes of the skies."

The lyrical expression which praises without lamentation is found in the ode which Dryden's two examples, "Song for St. Cecilia's Day" and "Alexander's Feast," both in praise of music, restored in an elaborated form of song. His successors in the eighteenth century, Collins and Gray, treasuring even more highly classical tradition and methods, used the ode as their vehicle of expression when the slightness of subject hardly needed one so massive.

Of such are Collins's "Ode to Simplicity" and Gray's "Ode on the Pleasure arising from Vicissitude." The Pindaric odes of Gray, "The Bard" and "The Progress of Poesy," and Collins's "Ode on the Passions," with their wealth of personification and energy of description, are more sympathetically allied in matter and manner. They are marked, too, with some relief from the prevailing tone of melancholy of these poets, a melancholy which finds its consummate expression in Gray's "Elegy in a Country Churchyard." Great is the contrast between Milton's "Lycidas" and this, and between it and Shelley's "Adonais."

With the opening of the nineteenth century we come to the lyrical poems of the three masters—Keats, Shelley, and Wordsworth. Keats with his Greek approach to nature, Shelley with his mystical conceptions of the universal spirit of love, and Wordsworth with his philosophical interpretation of the relation of nature to man, revealed and developed fresh subjects and modes of thought. Nearly every collection of lyrical verse contains Keats's odes, "On the Poets," "To a Nightingale," "To Autumn," and "On a Grecian Urn." The absolute melody of his verse is shown triumphantly in his "Ode to a Nightingale." By poetic tradition this bird is the appropriate object of tender apostrophe, and Keats weaves into his ode suggestion and image, and visualises the soothing shadows in which the bird music thrills the heart.

"Darkling I listen; and for many a time
I have been half in love with easeful Death;
Call'd him soft names in many a mused rhyme,
To take into the air my quiet breath;
Now more than ever seems it rich to die,
To cease upon the midnight with no pain,
While thou art pouring forth thy soul abroad
In such an ecstasy!
Still wouldst thou sing, and I have ears in vain—
To thy high requiem become a sod."

Shelley's "Ode to a Skylark" is similarly immortal, and it is not so charged with a sense of sadness as his "Ode to the West Wind"—

"Oh! lift me as a wave, a leaf, a cloud!
I fall upon the thorns of life! I bleed!
A heavy weight of hours has chain'd and bow'd
One too like thee—tameless and swift and proud."

Here we have the same picture of the frail, driven

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spirit as in the "Adonais," when, amongst the Mountain Shepherds who came to the dead poet's bier, was the "phantom among men," who

> "fled astray
> With feeble steps o'er the world's wilderness."

The poetic strain of Wordsworth is of robuster fibre; and in his "Ode to Duty" and "Ode on the Intimations of Immortality," he delivers not only a message but a creed. Perhaps nowhere else in so small a compass can we find Wordsworth's poetic and philosophical insight so clearly expressed as in his sonnet, "The Inner Vision."

> "Most sweet it is with unuplifted eyes
> To pace the ground, if path there be or none,
> While a fair region round the traveller lies
> Which he forbears again to look upon;
> Pleased rather with some soft ideal scene
> The work of Fancy, or some happy tone
> Of meditation, slipping in between
> The beauty coming and the beauty gone.
> If Thought and Love desert us, from that day
> Let us break off all commerce with the Muse:
> With Thought and Love companions of our way
> Whate'er the senses take or may refuse,—
> The mind's internal heaven shall shed her dews
> Of inspiration on the humblest lay."

When an anthology is known and loved, it remains only for the possessor to make his own, and to place therein any poem, by whatever poet, which has given him delight or illumination, or inspired him to care for beauty and nobility of thought.

THE TENUGUI AND ITS USE.

BY KEN HOSHINO.

THERE is nothing so commonly used in Japan as the tenugui, yet little is known about it in this country. It is the custom of our people to take a small present, generally a tenugui, wrapped in an ornamented piece of paper bearing their name, when they call on their acquaintances. I once took a tenugui with me when I made a visit to a friend of mine, and presented it to him. After examining the tenugui, he asked me whether the piece of cloth was a handkerchief such as is used by a "rikishaw" man in Japan. Yes, it may be used in this way by a rikishaw man, but it is also used by a nobleman as a towel, but not as a handkerchief.

The tenugui is a piece of cotton cloth, a yard long and a foot wide, on which a beautiful design is printed in colour with permanent dyes. As in the case of the Japanese wood-block prints, the pictures on the tenugui are chiefly studies of birds and flowers. Although one hardly finds so many colours in a tenugui as in a wood-block print, nevertheless one often finds pictures on tenuguis as refined as those of Kakemono's or as decorative as those on beautiful screens. In Japan, a poor man who can earn sixpence a day can enjoy the luxury of hanging an artistic picture from a bamboo pole. In fact, a tenugui of exceptionally artistic design is often prized, not only by a poor man, but also by a rich one, who will hang the tenugui over a stone lantern in order to make his garden more picturesque. Sometimes one finds a tenugui with a poem or sacred words imprinted in black or in blue. A tenugui of the latter character is not used as a towel, but for decorating a shrine. I doubt whether tenuguis were originally made for "Nobori" banners to decorate shrines.

I think it is quite a modern custom to use tenuguis as a means of advertisement in Japan. Nowadays we often find tenuguis bearing rather grotesque designs and trade marks. Such tenuguis are generally made for business houses which use their tenuguis as "keibutsu" or presents to their customers. So although some of the tenuguis are not artistic, nevertheless we can agree, without reserve, with Mr. Audley, who writes in his book entitled the *Ornamental Art of Japan*: "From an artistic point of view, probably the common towels of the country are the most worthy of note; they present designs in endless variety invariably striking and pleasing in character."

There are many other ways of using the tenugui. A number of them can be made into a kimono, which is most comfortable on a hot summer's day, especially after taking a bath. These kimonos made of the tenugui cloth are termed "yukata"—that is, a kimono worn after a bath.

A beautiful tenugui is often used for a woman's headwear. In the cherry blossom season one can see tea-house girls with their pretty tenuguis artistically wound round their heads. At bathing places one is sure to find bathers with tenugui caps.

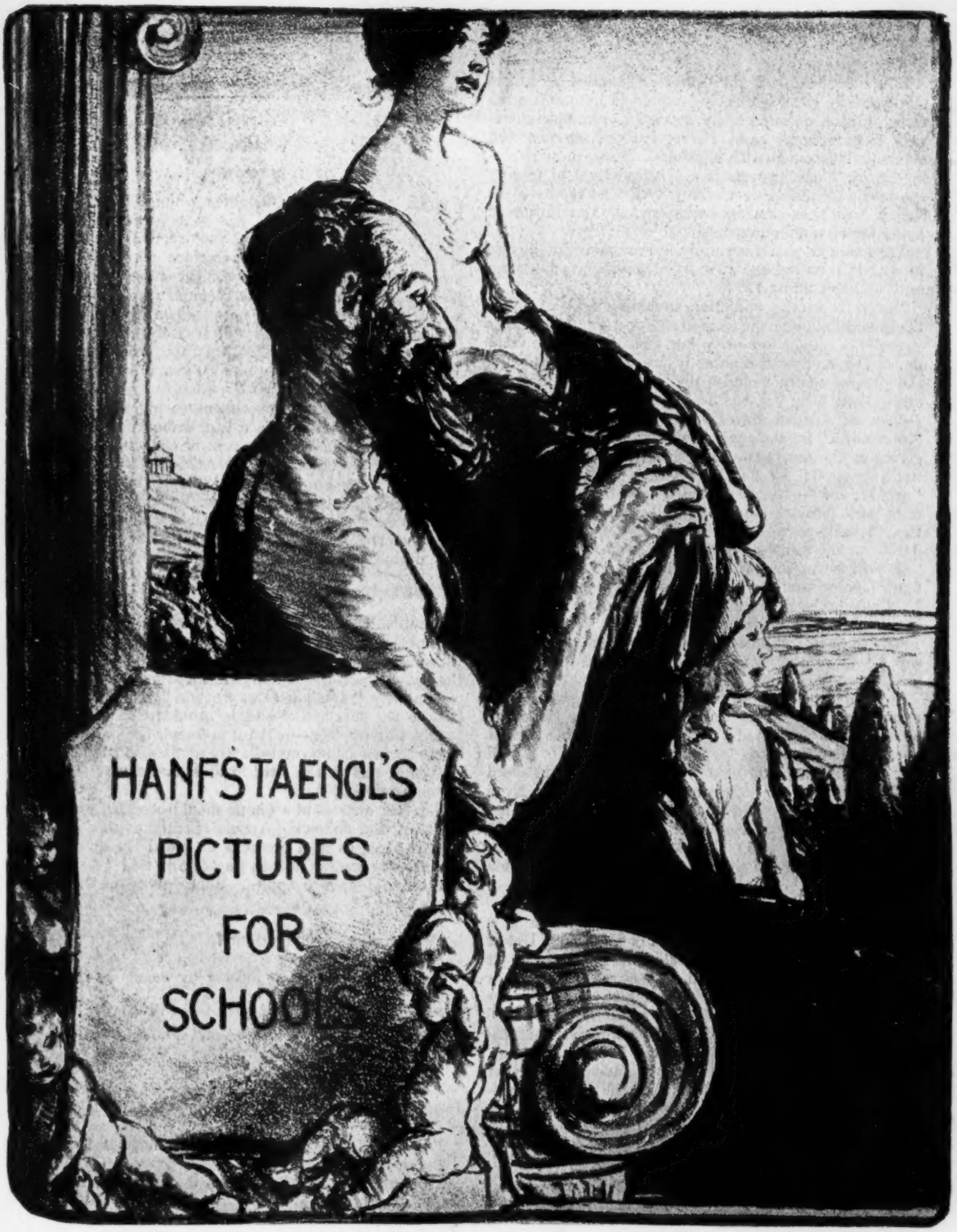
Besides these, there are other uses, as for making "noren" or curtains, covers of "tansu" or bureaus, and even bags of every description.

MULTIPLICATION OF DECIMALS.

AT these times, when we attempt to educate more by reason than by rote, it is well to consider whether the terms we apply to certain processes are appropriate or not.

There is probably no more unfortunate term than "multiplication;" first, because of the difficulty experienced by children in its pronunciation; and second, because of its unfitness in application. In the ordinary sense, we associate the word with an increase from a common stock, as in the case of the potato, which, when planted in suitable soil, produces many others. In this way potatoes may be truly said to multiply.

The process of emptying and grouping together the contents of several bags, each containing the same number of potatoes, cannot in the same sense be called multiplication, yet it is to an analogous mathematical operation that we apply the term. Many will agree that, as far as possible, the recognised meanings of words should be retained and not distorted in order to make them fit our requirements.



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It is questionable if the processes summed up under this word are capable of being expressed by one general term; for, on looking closely at various examples, it is seen that in some cases the operations are just the reverse of those met with in others. Thus, in multiplying 23 by 7, the process is a short method of finding the result of adding seven twenty-threes together. In such a case, then, multiplication means the addition of a number of equal quantities.

The example would certainly appear more intelligible to a child if stated as, "Find 7 times 23," rather than as, "Multiply 23 by 7."

But it is in the operation involving fractions that the unsuitability of the term is so apparent. The name suggests a larger quantity for the result than that multiplied, and yet it is actually less than this. Further, the process really includes division. For example, in multiplying 3 by 0·2, the 3 units have to be decimated—that is, divided into 10 equal parts, obtaining 3 "deci-units" for each part, and then 2 such parts taken, giving as the answer 6 deci-units, or 0·6. Similarly, in multiplying 0·6 by 0·03, the 6 deci-units have to be "centimated"—that is, divided into 100 equal parts, each part obtained being 6 "milli-units," or ·006; and then 3 such parts taken, giving 18 "milli-units," or 0·018, for the result—a quantity less than 0·6.

It will be noticed that the kind of the multiplying figure shows how the number to be multiplied has to be divided, the digits indicating how many such parts have to be taken together.

The same is true in multiplying by a vulgar fraction, say $\frac{2}{3}$. The quantity multiplied is divided into thirds, and 2 such parts taken together.

It is evident that we cannot speak of taking a quantity a fractional number of times, and therefore the mode of expression suggested for an integral number cannot be applied to this case. The examples might be stated as follows: Find 0·03 of 0·6, Find $\frac{2}{3}$ of $2\frac{7}{16}$, the word "of" denoting the operation to be effected. Even when the multiplier is a mixed number, little objection can be raised to the use of the word "of," as in 2·35 of 27·2, or in $3\frac{7}{16}$ of $5\frac{1}{2}$, the method of working merely being a short way of finding the result of an addition sum consisting, in the first example, of two lines of 27·2, and a third line of 0·35 of 27·2.

From the statement of the example, the pupil is given some idea as to what is really required. Unless the process has been presented in such a way, great difficulty will be experienced in recognising problems involving it. For example, in finding the total number of trees in an orchard consisting of 25 rows, with 36 trees in each row, as soon as the pupils realise that the total number is 25 times 36 they know how it is obtained.

Teachers in close touch with beginners know that they are continually forgetting both the word "multiplication" and its meaning. Multiplication is the recognised general term for a number of operations, but it can be avoided or kept well in the background by the frequent use of the expressions suggested.

Should a general term be necessary, "evaluation" would be wide enough to cover all cases; but the word does not indicate the nature of the process by which the result is obtained.

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A FIRST LESSON ON SYMBOLICAL EXPRESSION AND EASY PROBLEMS IN ALGEBRA.

BY P. H. WYKES, M.A.

ONE of the chief difficulties which the teacher of elementary algebra has to contend with is to get pupils to represent in the symbolical notation of algebra the results of operations which the same pupils will perform with the utmost ease in arithmetic. We are all acquainted with the pupil who tells us that a man who is x years old now will be $5x$ years old in five years' time, and who will scarcely credit that he has made a mistake, until shown that, according to his calculation, a man who is now 30 years old will be 150 years old in five years' time!

It is an interesting experiment to put the following question to a class who are just embarking on "symbolical expression": "*The sum of the ages of the boys in the front row is x years. What will the sum of their ages be in seven years from now?*" If the teacher goes round and inspects the answers, he will be fortunate if he finds that 10 per cent. of the class have taken into account the number of boys in the row, and he will probably find that the answers of the remainder vary between $7x$, $\frac{x}{7}$, $\frac{7}{x}$, and $x + 7$.

Practically the only difficulty which the pupil experiences in his attempts to solve an easy problem is this one referred to—that is, to express algebraically the quantities involved in the question. There is no reason why "symbolical expression" and its application to the solution of simple problems should not be taught side by side—in the first lesson the easiest cases of the former being immediately applied to solving easy problems, and in the later lessons harder cases of each being developed.

The first quarter of an hour should be spent with oral work of the following type. [I might here remind readers that, as in a previous article, I set down only the *ultimate* answer to each question.]

Teacher. I have 5 apples. Jones gives me 4. How many have I?

Pupil. Nine.

Teacher. How did you do it?

Pupil. I added 5 and 4.

Teacher. Express your answer by means of the sign of addition.

Pupil. $5 + 4$.

Teacher. I have x apples, and Jones gives me 4. How many have I?

Pupil. $x + 4$.

Teacher. I have x apples, and receive y apples from Jones. How many have I?

Pupil. $x + y$ apples.

Teacher. What is the next number above 18?

Pupil. Nineteen.

Teacher. How can you always find the next number above a certain one?

Pupil. Add 1 to it.

Teacher. What is the next number above x?

Pupil. $x + 1$.

Here the teacher might tell his class that in future he will require the answers in such a form as to show how they were obtained, and should give an example to explain his meaning.

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Teacher. This room is 16 feet long and 20 feet broad. What is the area of the floor?

Pupil. 16×20 square feet.

Teacher. Suppose it is x feet long and y feet broad. What is its area?

Pupil. xy square feet.

Other simple questions which might be propounded are: How many feet in 4 (and then x) yards? How many shillings in £7 (and then £t)? What is the cost of 15 books at 3s. each? What is the cost of m books at k shillings each?

By means of these and other simple questions the pupils should be led to see that to express any operation algebraically it is very helpful to try a corresponding question in arithmetic, and watch, not the *result*, but the *process* by which the result was obtained. The teacher should now *start* with an algebraic instead of an arithmetical question, and should see that the pupils (*a*) make up a corresponding question in arithmetic; (*b*) answer this question, noting the *process;* and (*c*) answer the original algebraic question. I give one example only which appears on the blackboard, though several others of a similar type might be done mentally.

Teacher first puts question on the board, and then asks the pupils to make up for themselves a similar example in arithmetic. He chooses one pupil, who says, "What is the cost of 18 apples at 3 a penny?"—the 18 and 3 appearing on the board in the place indicated.

Teacher. What is the cost?

Pupil. Sixpence.

Teacher. How did you do it?

Pupil. I divided 18 by 3.

Teacher. What is the answer, then, to the question on the board?

Pupil. $\frac{x}{y}$ (or x divided by y).

After a little oral practice with a few such examples, the second question is written on the blackboard, and when a pupil has read the question through aloud the class proceeds to develop the solution as follows:—

Teacher. What is the first statement in the question?

Pupil. A man is x years old.

Teacher. What is the number of years in his present age?

Pupil. x equals the number of years in the man's present age.

Teacher. What will the number of years be in 5 years' time?

Pupil. $x + 5$.

Teacher. What was the number 14 years ago?

Pupil. $x - 14$.

Teacher. What statement have we still to use?

Pupil. He will be twice as old in 5 years as he was 14 years ago.

Teacher. Use what we have on the board to express this fact.

Pupil. $x + 5 = 2(x - 14)$.

The equation is then solved as usual, and when $x = 33$ is obtained the pupils must be warned that the question is not answered until some such sentence as "Therefore the man's present age is 33 years" is written down. Finally, the result must be verified orally. Here the teacher should point out that there was no real necessity for the appearance of an x in the question, and that it might have been set thus: "If a man will be," etc. The opening statement on the blackboard would then appear as: "Let x = the number of years in the man's present age."

There will probably be time to deal with the third question on the board, and the questioning should proceed on similar lines until the solution reads as on the blackboard. It should also be shown that this question may be answered by several other methods: for x may be taken to be either the number of apples which A has or which C has; and again, any one of the statements may be taken last to form the equation. For instance:—

Let x = the number of apples A has.
$\therefore x - 2$ = " " C has.
and $3x$ = " " on the tree.
$\therefore 3 = x + x - 2 + 21$.
$\therefore x = 19$.
$\therefore$ number of apples on the tree = 57.

The equation here formed is clearly easier than the first one, but the first method is the one which boys are most likely to discover for themselves. The important points which the teacher should not fail to impress on the class with regard to problems, and which they will appreciate all the more when Questions 2 and 3 have been dealt with, are:—

1. x can only represent a *number*.
2. Every quantity involved in the problem should be expressed algebraically before any attempt is made to form an equation.
3. Every statement must be made use of, and from one an equation will be formed.
4. The two sides represent numbers only.
5. The answer should always be tested.

It will be necessary for the teacher to work *with* the class during the whole of the next algebra lesson, the pupils writing down the work in their books simultaneously with its appearance on the blackboard.

Blackboard Work.

1. What is the cost of x (18) apples at y (3) a penny?

Cost of 18 at 3 a penny = 6d.—that is, $\frac{18}{3}$ pence.

$\therefore$ cost of x at y a penny = $\frac{x}{y}$ pence.

2. A man is now x years old. How old will he be in 5 years? How old was he 14 years ago? If he will be twice as old in 5 years' time as he was 14 years ago, what is his present age?

x = number of years in his present age.
$x + 5$ = " " " age 5 years hence.
$x - 14$ = " " " age 14 years ago.
$\therefore x + 5 = 2(x - 14)$. $\therefore x + 5 = 2x - 28$.
$\therefore 33 = x$. $\therefore$ the man's present age is 33 years.

3. Three boys, A, B, C, divide the apples on a tree. A takes one-third of the apples, B takes 21, and C the rest. If A has 2 more apples than C, how many apples were there on the tree?

Let x = number of apples on the tree.
$\therefore \frac{x}{3}$ = " " A has.
$\therefore x - \frac{x}{3} - 21$ = " " C has.
$\therefore x - \frac{x}{3} - 19$ = two more than C has.
$\therefore \frac{x}{3} = x - \frac{x}{3} - 19$.
$\therefore 19 = \frac{x}{3}$.
$\therefore x = 57$.
$\therefore$ there were 57 apples on the tree.

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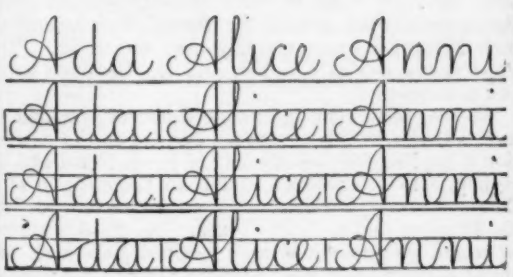

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IT is frequently urged that a proper understanding of the history of Great Britain is impossible to the student, unless he reads a certain amount of European history in conjunction.

There is a vagueness about the amount of European history to be read which, on reflection, is scarcely diminished. If the statement means anything more than what lies outside of British history proper, it must mean a knowledge of the modes of government, their origin and development, which prevail to-day in the chief countries on the Continent.

The student of the period 1763 to 1815 reads that the Emperor, Joseph the Second, abdicated his position as head of the Empire, and contented himself with the title of Emperor of Austria. He will see little in this statement to arrest his attention, and yet it is probable there are two points in it that he does not appreciate.

1. What was the Empire, and how did it come into being?

2. Why was the title Emperor of Austria a misnomer?

The first question would not present any difficulty to the average schoolboy if history teaching were properly conceived. As matters now stand, there are few pupil teachers—and I include those who have passed through a secondary school—who can furnish a moderately accurate answer. In the early stages of the subject we need more generalisation and less detail.

If we except the Crusades and the flirtings of Henry the Eighth with the Empire and Francis the First, little evidence of English influence in Continental affairs is found until the time of William the Third. Our Henry the Third's brother, Richard of Cornwall, had indeed been accepted Emperor, but his power was never more than nominal. Beyond squandering money for two years of recognition, little can be said of him as Emperor. Cromwell's activity gave us a higher position amongst the nations than we had ever held before; but it was very short-lived—a meteor flash that died out in a decade. Fortunately our insular position saved us from many troubles and difficulties at the time; but the understanding of present-day affairs can be reached only by a knowledge of past events, many of which were of seemingly little importance to us in their inception.

It is an exceptional class that has an intelligent idea of the Empire or the Papacy after "learning all about" Henry the Eighth, the various Diets of Luther's time, and James the First's inaction in regard to the Palatinate. The following account is put forward as providing the minimum information which the student should possess.

The Empire.—After the break-up of the Roman Empire, the peoples of Europe receded in civilisation and government. New nations arose, and communication between them did not exist save in cases of actual warfare. Over the greater part of the Continent darkness seemed to have settled. The country we now know as Prussia had not even a settled government of any kind until the thirteenth century. Its resources and topography were unknown to its neighbours as late as the reign of our Edward the Third.

Towards the end of the eighth century a great soldier and organiser, Karl, or Charles, the King of the Franks, made himself the greatest king in Europe by conquering the western half of the mainland. Eventually he made his way into Italy, and freed the Bishop of Rome from his enemies. In 800 A.D. he was crowned Emperor—that is, he was recognised as the successor to the great Roman emperors of the Western Empire.

From this time onward the Emperor was, *in theory*, the leader of Christendom and *primus inter pares* amongst the great kings; *in practice*, no long time elapsed before he was elected, sometimes from one great reigning house, sometimes from another. He was as strong as he could make himself, and was disobeyed not infrequently, even by the German states over which he was supposed to exercise a direct authority. In Italy his power was more frequently denied than allowed. All Christendom continued to have a great reverence for his office, but seldom showed it to the holder.

In the Middle Ages the Empire was composed, roughly speaking, of present-day Germany, the Duchy of Austria, the eastern strip of France, and the Netherlands. About the time of Simon de Montfort's Parliament the election of the Emperor became settled in the hands of seven German magnates, who not only were jealous of the authority of their leader, but handed down their jealousies to their successors.

The Emperor's power gradually waned until the Napoleonic wars. Then Joseph the Second, realising the onus of defending a vast and unprofitable dominion, and finding his resources insufficient for the charge, abdicated the imperial crown. He retreated to his duchy of Austria and kingdom of Hungary, *but illogically retained the title of Emperor.*

The Papacy.—The history of the Papacy may be put more briefly still. Shortly after the seat of the Roman Empire had been moved to Nova Roma (soon to be called Constantinople), the Church was divided into factions. The Orthodox or Greek Church had its headquarters in the new capital, while the Bishop of Rome maintained a doubtful power in the west. Great ability was displayed by a series of bishops, who soon came to regard themselves as something more than the heads of a sectional Church. They styled themselves "Father of the Church"—as the words "Il Popo," "Papa," and "the Pope" suggest—until by the time of Frederick Barbarossa (when Henry the Second was struggling with Becket) a legate actually used the words, "The Pope greets you as a father, and the Cardinals greet you as brothers."

We see, then, that the innate desire of mankind to have a leader, if only a nominal one, led to the re-creation of an Emperor because he had saved Rome and its Bishop from extirpation; and next, the creation of a Church hierarchy, which waxed strong enough to defy the Emperor and to depose kings. The Papacy ceased to regard its possessions as a glorified glebe-land, but aimed at becoming a great temporal power. The marked ability of the Borgia family substantiated this claim, and from their time until the unification of Italy in the last century the temporal power was an accomplished fact.

The above meagre history is put forward as the very minimum knowledge a pupil should be equipped with. It is indeed difficult to see how any student can understand the affairs of his own country unless he knows something of the Empire and the Papacy.

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FRANÇOISE D'AUBIGNÉ had tasted to the full the bitterness of poverty during a gray girlhood. As wife of the deformed poet Scarron she enjoyed the society and friendship of the *literati* of the capital, and shone as a conversationalist in the *causeries* of the savants of the salons. *Institutrice* to the illegitimate children of the monarch, she discovered her true vocation of teaching; and as wife and directress of Louis the Fourteenth, Madame de Maintenon exercised extensive influence, and scarcely surpassed powers, in the affairs of the State.

Ever a lover of girls, Madame de Maintenon founded a small school for poor gentlewomen at Montmorency. It was transferred to Rueil, where sixty boarders lived in a house ill-appointed, in which, owing to lack of means, they were threatened with starvation.

Louis the Fourteenth, whatever his blemishes may have been, loved his country and people. War, which robbed him of his officers, at the same time left their widows and children penniless. When Madame appealed to him for help he granted her the castle of Noisy, and funds to maintain a hundred daughters of the ruling class. Thus a private venture school became a State-aided institution.

The directress of the king's conscience next secured letters-patent (1686) for the creation of Saint-Cyr, where two hundred and fifty girls nobly born were to receive free State-aided education suitable to their future in life. This innovation marks a breach with the traditions of the past, and the beginning of the downfall of monastic education in France. The austerities of Jacqueline de Pascal found no favour with Madame de Maintenon, who disliked the practices of conventual schools. The daughters of *La douce France*, brought up in a secular house at the expense of the monarch, were destined for the life of the court, and not for the cloistral activities of the monastery. They had need of spirit, conversational ability, and the delicate gift of agreeable raillery. The ideal product of Saint-Cyr consisted of the healthy, well-developed young gentlewoman, pious enough, domesticated, and able to play her part with distinction in home and court.

Two stages mark the development of Saint-Cyr, the first experimental (1686-1692), and the second one of stability (from 1692). The internal reform leading to stability commenced in 1688.

The first superior, an Ursuline, the literary Madame de Brinon, charming, spirited, witty, vain somewhat, altogether good-humoured and lovable, gained the affection but not the goodwill of the bevy of high-spirited *demoiselles* under her charge. Fitted rather for the *rôle* of friend than for the position of mistress, she lacked the disciplinary and controlling power necessary in a principal.

For her pupils she wrote religious plays, which they acted in character; they also played little dramas written by themselves. A *furore* of acting ran through the school by the side of a craze for writing. The *demoiselles*, too, read books—all sorts of books—many of which it was not good for them to read; a greed for reading, a craze for writing, a passion for acting, kept the school in a ferment of excitement. Brilliant conversation, rippling sallies, sweet babblements, agreeable raillery, delicate repartee—the embellishments necessary to grace a court—developed freely.

With all these mundane excitements, and in addition to this literary activity, a deep religious feeling pervaded the school; but of the two streams the former proved the stronger.

For the purpose of diversion, two plays written by Racine—*Esther* and *Athalie*—were prepared. The court and the king came to see and to hear. What trouble about costume! What careful toilettes! What polishing of songs! What practice of elocution! And then the jealousies, the fluttering of hearts, the animosities, the anticipated triumphs in that nest of singing birds! The king came, and was conquered; the court listened, and generously applauded; the *demoiselles* achieved a success that had to be repeated. That which at first had been recreation had become a regular entertainment.

A disintegration of the work of the school followed. Royal smiles turned giddy young brains. Discipline, already lax, suffered in proportion. One pert miss, believing herself to be indispensable, refused to obey instructions, and replied impertinently to remonstrances. Another did not want to sing in church for fear of spoiling her sweet voice. Madame de Maintenon heard of the revolt of the sirens. Madame will have none of it. "No, certainly, miss; and if I hear speak of you again, you will depart from the house."

Madame de Maintenon realised that she had accomplished rather more than she had set out to accomplish. The *demoiselles* possessed spirit, but it was used against good order; their elevation of heart had deteriorated into pride and haughtiness; their reason had been formed, but it militated against simplicity of character, and made them vain, talkative, curious, presumptuous, and impertinent.

The practical common sense of Madame de Maintenon soon found a remedy. She had the courage to carry out strong measures of reform in the face of strong opposition. Madame de Brinon surrendered her trust; but the impetus was not to be arrested in a moment. Blaming herself rather than the girls, the foundress set herself resolutely to retrace her steps. Recognising the fact that everything—the royal favour, the situation of the house near the court, her own patronage—favoured the growth of vanity and pride, she devised means for abasing the pride of the girls without losing sight of the ends for which the institute had been founded.

Louis the Fourteenth turned a deaf ear for a time to suggestions of reform; but he yielded to his directress at length, and was permitted once a year, in the absence of the court, to see a performance of *Athalie*. In 1692 he caused letters-patent to be issued *nominally* changing Saint-Cyr into a monastery of St. Augustine: in practice it remained a secular school, with a stiffening of the discipline, a hardening of the rule.

Madame de Maintenon gave her institution unceasing care and whole-hearted devotion. Nearly every day she personally supervised the staff, frequently arriving at six o'clock in the morning. She imposed her spirit on the mistresses, and inspired the pupils through her influence. In a very active and real manner she was directress of education and mistress of method. The members of the staff were selected from the scholars. Her first care was to train these, and the means employed consisted of conversations, letters, model lessons, and demonstrations. She contributed six volumes to pedagogy—namely, *Letters and Conversations on the Educa-*

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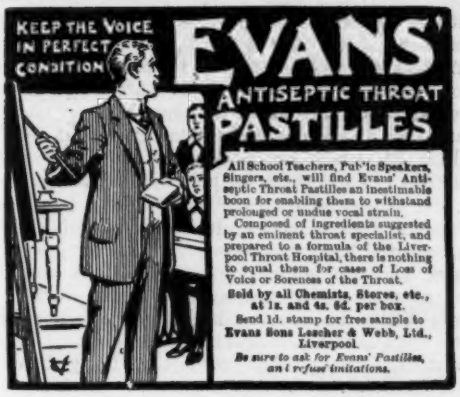
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tion of Girls, Counsels to Young Women who enter Society, and *Historical and Instructive Letters addressed to Saint-Cyr,* wherein may be read in fluent and lucid French those principles upon which the valuable practice of Saint-Cyr was founded. From these a thousand wise maxims—pedagogic gems—might be gathered.

Madame de Maintenon sought to inspire her "dames" with a sense of the nobility of the vocation of teaching, wherein could be exercised mortification, perfection, austerities, and obedience. To the care of their charges they could devote all their lives in utter self-abnegation. A few hours' daily instruction would serve to fill the memory; but to form the reason, to educate the mind, to eradicate evil inclinations, to instil an active love of virtue, called for unceasing care and never-ceasing effort.

Experienced woman of the world as she was, these letters reveal a keen insight into character, a power of penetrating the innermost recesses of the mind. Neither the good nor the bad qualities of mistress or pupil escaped her all-regarding eye. Quick to praise the one, she keenly criticised the other. Her judgments seem unerring, and the remedies she suggests infallible.

Her studies of child life are full of subtle yet real distinctions, recognitions of the details which count, and knowledge of the motives leading to action. She recommends the mistresses not only to know each child intimately, but to teach the individual rather than the class. She reiterated the doctrine of the need for simplicity in teaching. "You speak too much," she wrote to a young mistress; "you are too eloquent. For example, you say that an eternal divorce with sin is necessary. That is true enough, and well said; but I believe there are not three girls in your class who know what a *divorce* is. Be simple, and aim only at making yourself understood."

With respect to moral training, Madame de Maintenon held advanced views. In order to instruct in the niceties of honour, of probity, of generosity, of humanity; in order to paint virtue in its true colours, she warned her dames to guard against "sermonising." The incidental rather than the formal teaching of ethics, using anecdotal illustrations, found favour with her.

The common sense and sweet reasonableness of Madame showed in her views respecting discipline, which she wished to be founded on the pupils' esteem of a mistress well-beloved. Since, however, sweetness and love do sometimes fail, punishments must needs be used. Faults cannot be removed all at once, nor altogether, therefore they ought to be attacked separately.

The "poor girls nobly born" entered the house of Saint-Cyr between the ages of six and thirteen, leaving, when they did not stay to teach, at the age of twenty, often to be married. Owing to the fact that their education was a State charge, neither parent nor guardian exercised any control during the time they were under the government of the dames, but parents might see their children four times during the year in the presence of a mistress. There were no holidays but much recreation, and neither mistress nor pupil suffered from *ennui*.

The four classes, named after the distinctive ribbons worn over the black robe, were the reds, the greens, the yellows, and the blues. From the yellows and blues thirty selected monitresses assisted in the work of the school: ten of these, recognised by an orange-coloured ribbon, were attached to the two lower classes; twenty, marked by a black ribbon, rendered aid anywhere, and took a share in household management. Each class was further subdivided into families of ten, with its *mother of the family,* assistant, and supply.

This family of families, under Madame de Maintenon, a superior, and forty dames, rose at six o'clock in the morning, and retired for the night at nine. The hours of the day were occupied with devotion, study, manual labours, household duties, and recreation. The *précieuse* and literary education of the first period had given place to one very practical—a sound preparation for the home as well as for the court.

Much attention was given to physical development and to healthy conditions. Cold water served for the toilet, except in the case of the younger ones in winter. Neither feast days nor fast days were observed, but each received of the plain substantial fare sufficient for her needs. The girls sat on hard chairs and slept on hard beds. Fires were used only when absolutely necessary.

Physical exercise, it is true, included dancing, but for this purpose household work served. The elder pupils dressed the little ones, combed their hair, made the beds, swept the house, tidied the infirmary, and helped in the preparation of the food; even the juniors plucked flowers for syrup, gathered fruit, and prepared vegetables. All learned to sew, to embroider, and to make tapestry and linen.

A high moral and religious tone pervaded the institution, and this was not allowed to degenerate into mere "goodiness." The piety of the girls consisted rather in the innocence of their lives than in the austerities and refinements of devotion.

On the intellectual side the syllabus of studies comprised religion, writing, calculation, grammar of the French language, history, and music. Since Madame more and more regarded education as a severely practical training for the duties of life, reading entered less and less into the scheme of studies. "Teach your girls," she advised, "to be very sparing in reading, and to prefer manual labour, the care of the house, the duties of their station; and if they have a desire to read, see that the books are carefully selected, calculated to nourish their piety, to form their judgment, and to regulate their morals." While history received little attention, the teaching of the mother tongue exercised the powers of the pupils, and the constant care of the staff. Composition, example, reading, writing, dialogues, and repetition united in producing that delightfully easy, picturesque style which marks the letters written by past students of the school. That which was written had to be founded on good sense. "Accustom your girls to write simply," was the advice she gave. "They do not know how to make a short letter. It is necessary to teach them to say what they have to say in few words, and to put only four lines when they will contain the matter."

Looking forward to the time when her beloved *demoiselles* would be no longer under her maternal care, Madame de Maintenon spoke to them seriously, delicately, and without prudery of moral evil, and of the perils by which they would be surrounded in the great world; and she freely discussed with them the duties of married life without disguising the possibility of its hardships and difficulties.

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